THE ATHENÆUM

Journal of English and Foreign Literature, Science, and the Fine Arts.

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For the convenience of Subscribers in remote places, the weekly numbers are reissued in Monthly Parts, stitched in a wrapper, and forwarded with the Magazines.—Subscriptions for the Stamped Edition for the Continent, for not less than 3 Months, and in advance, are received by M. BAUDRY, 9, Rue du Coq-St.-Honoré, Paris, or at the Athenæum Office, London. For France, and other Countries not requiring postage to be paid in London, 28 fr. or 1l. 2s. the year. To other countries, the postage in addition. [JAMES HOLMES, TOOK'S COURT.]

UNIVERSITY COLLEGE, LONDON.—FACULTY OF MEDICINE.—Session 1840-41.

The Classes will commence as follows:

ANATOMY and PHYSIOLOGY..Professor Sharpey, M.D. October 1, at 10 o'clock.
CHEMISTRY..Professor Graham. October 1, at 11 o'clock.
ANATOMY..Professor Quain. October 1, at 12 o'clock.
MEDICINE..Professor Williams, M.D. October 1, at 6 o'clock.
SURGERY..Professor Cooper. October 1, at 7 o'clock.
COMPARATIVE ANATOMY..Prof. Grant, M.D. October 2, at 3 o'clock.
MIDWIFERY..Professor Davis, M.D. October 5, at 9 o'clock.
MATERIA MEDICA..Prof. Thomson, M.D. October 5, at 3 o'clock.

Prospectuses and further particulars may be obtained at the Office of the College.

S. COOPER, Dean of the Faculty.
CHAS. C. ATKINSON, Secretary to the Council.

24th Sept. 1840.

UNIVERSITY COLLEGE, LONDON.—FACULTY OF ARTS AND LAWS.—Session 1840-41.

The Session will commence on Wednesday, the 14th October, when Professor Creasy will deliver a Lecture INTRODUCTORY to his own Courses, at Two o'clock precisely.

Classes.

LATIN..Professor Key, A.M.
GREEK..Professor Malden, A.M.
HEBREW..Professor Hurwitz.
ARABIC, PERSIAN, and HINDUSTANI..Prof. Falconer, A.M.
CHINESE LANGUAGE and LITERATURE..Professor Rev. Samuel Kidd.
ENGLISH LANGUAGE and LITERATURE..Prof. Latham, M.D.
FRENCH LANGUAGE and LITERATURE..Prof. Merlet.
ITALIAN LANGUAGE and LITERATURE..Prof. Pepoli.
GERMAN LANGUAGE..Teacher, Mr. Wittich.
MATHEMATICS..Professor De Morgan.
NATURAL PHILOSOPHY..Professor Sylvester, F.R.S.
CHEMISTRY (Practical Course, commencing in May)..Professor Graham, F.R.S.
CHEMISTRY (Course for the Matriculation Examination in Arts at the University of London)..Professor Graham.
BOTANY, Junior Class do. (commencing in April)..Professor Lindley, Ph. D.
ZOOLOGY..Professor Grant, M.D.
PHILOSOPHY OF MIND and LOGIC..Professor the Rev. J. Hoppus, Ph. D.
HISTORY, ANCIENT and MODERN..Professor Creasy, A.M.
ENGLISH LAW (commencing 4th Nov.)..Prof. Carey, A.M.
JURISPRUDENCE (commencing 3rd Nov.)..Prof. Graves, A.M.
CIVIL ENGINEERING..Professors De Morgan, Graham, and Sylvester.
DRAWING, in all its branches..Teacher, Mr. G. B. Moore.
SCHOOLMASTERS' COURSES..Professors Key, De Morgan, Sylvester, and Malden.

FLAHERTY SCHOLARSHIPS.

A Flaherty Scholarship of 50*l.* per annum, tenable for four years, will be awarded in 1841 to the best proficient in Classics among the Students of the College under the age of twenty years. The Examination will take place in the second week in October. A similar Scholarship for proficiency in Mathematics and Natural Philosophy will be awarded in 1842, and in subsequent years, alternately, for proficiency in Classics, and in Mathematics and Natural Philosophy. Printed copies of the Regulations concerning these Scholarships may be had on application at the Office.

The Session of the Faculty of Medicine commences on 1st October.

14th August, 1840.

T. HEWITT KEY, Dean of the Faculty.
CHAS. C. ATKINSON, Secretary to the Council.

KING'S COLLEGE, LONDON.—DEPARTMENT of CIVIL ENGINEERING and ARCHITECTURE, and of SCIENCE applied to the Arts and Manufactures.—This Department, under the superintendence of Professors Hall, Moseley, Daniell, Wheatstone, Hosking, and Ansted, and Mr. Bradley, Mr. E. Cowper, Mr. J. Tennant, and Mr. H. J. Castle, will be RE-OPENED on TUESDAY, the 6th October next.

A Junior Class, for Pupils of the age of 14 years or upwards, will also be opened on the same day.

Sept. 1840. J. LONSDALE, Principal.

KING'S COLLEGE, LONDON.—DEPARTMENT of GENERAL LITERATURE and SCIENCE.—The COURSES will RE-COMMENCE on Tuesday, the 6th October next.

DIVINITY..The Rev. the Principal.
CLASSICAL LITERATURE..The Rev. R. W. Browne, M.A.
MATHEMATICS..The Rev. T. G. Hall, M.A.
ENGLISH LITERATURE..The Rev. F. Maurice, M.A.
NATURAL PHILOSOPHY and ASTRONOMY..The Rev. H. Moseley, M.A.
EXPERIMENTAL PHILOSOPHY..Charles Wheatstone, Esq. F.R.S.
ARTS of CONSTRUCTION..W. Hosking, Esq. F.S.A.
THEORY of the FINE ARTS..W. Dyce, Esq. M.A.
POLITICAL ECONOMY..The Rev. Richard Jones, M.A.
LAW..E. Bullock, Esq. M.A.
GEOLOGY..D. T. Ansted, Esq. M.A. F.G.S.
ZOOLOGY..Thomas Bell, Esq. F.R.S.
CHEMISTRY..J. F. Daniell, Esq. F.R.S.
BOTANY..David Don, Esq. Lib. L.S.
MINERALOGY..Mr. J. Tennant, F.G.S.
MACHINERY..Edward Cowper, Esq.
GEOMETRICAL DRAWING..T. Bradley, Esq.
SURVEYING..H. I. Castle, Esq.
HEBREW and RABBINICAL LITERATURE..The Rev. M. S. Alexander.
ORIENTAL LANGUAGES..Duncan Forbes, Esq.
FRENCH LANGUAGE and LITERATURE..Isidore Brasseur, Esq.
GERMAN Ditto..Adolph Bernays, Philos. D.
ITALIAN Ditto..G. Rosetti, Esq. L.L.D.
SPANISH Ditto..

SCHOOL.

The Classes will be re-opened on Thursday, the 1st October.

September, 1840. J. LONSDALE, Principal.

N.B. Chambers are provided for such Students in the Senior or Medical Department as are desirous of residing in the College; and some of the Professors, and other Gentlemen connected with the College, receive Students into their houses.

TO PARENTS and GUARDIANS.—A LADY, who resides in a pleasant and healthy spot in the immediate vicinity of the West End of London, WOULD LIKE TO RECEIVE A LITTLE GIRL as one of the family, to educate with her own children. Age not to exceed nine or ten years. Parents who are about to leave England for India or the Colonies, and desirous of insuring to their offspring a virtuous domestic education, in which the tenderness of the mother is blended with the vigilance of the instructor, would find this an opportunity that rarely offers. Terms, including everything, 100*l.* per annum.—Address to B. M., Post-office, Kilburn, Middlesex.

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PECKHAM SCHOOL, established upwards of 80 years, combines advantages not to be surpassed: the spacious mansion, gardens, play-ground, gymnasia, bath, &c., afford every facility for healthful accommodation and exercise; whilst the vicinity of Sydenham, Forest Hill, and other delightful and salubrious southern borderings of the Metropolis, invite to more extensive recreations. The domestic comforts have ever met with approval; and the distinction that has attended the gentlemen educated at this School, is a sure guarantee for success in the prosecution of studies for academical, professional, or mercantile pursuits. French is constantly spoken, and the Pupils have access to a carefully-selected library.—Prospectuses at Messrs. Bowdery & Kerby's, 190, Oxford-street; and Messrs. Relfe & Fletcher's, 17, Cornhill; or address to the Principal, Peckham School, Surrey.

QUEEN'S COLLEGE, EDINBURGH, WINTER SESSION, 1840-41.

The following CLASSES will be OPENED on WEDNESDAY, 4th NOVEMBER:

Pathology and Practice of Physic	Dr. W. Henderson	9 A.M.
Chemistry	Dr. Wilson	10 A.M.
Practical Chemistry	Dr. Wilson	9 to 4.
Physiology	Dr. John Reid	10 A.M.
Anatomy (Elementary and Descriptive)	Dr. Knox	11 A.M.
Anatomy (Demonstrations, including Surgical Anatomy)	Dr. Knox	3 P.M.
Practical Anatomy	Under the superintendence of Dr. Knox and Dr. Lonsdale	9 A.M. to 4 P.M.
Natural Philosophy	George Lees, A.M.	12 noon.
Practical Mechanics	Mr. Lees	1 to 4.
Forensic Medicine (Mondays, Wednesdays, and Fridays)	Mr. Skae	1 P.M.
Surgery	Dr. J. Argyll Robertson	2 P.M.
Midwifery	Dr. Campbell	2 and 6 P.M.
	Dr. Marr	3 and 6 P.M.
Materia Medica	Dr. W. Seller	7 P.M.
Mineralogy and Geology (with Excursions)	Mr. A. Rose	3 P.M.
Botany	W. Macgillivray, A.M.	—
Mathematics	W. Nichol, A.M.	10 to 2.
	W. Galbraith, A.M.	9 to 2.
	Mr. Murray	12 to 4.
Veterinary Surgery	Mr. Dick, Professor to the Highland Society	7 P.M.

ROYAL INFIRMARY, at Noon *Daily*.

Clinical Medicine.		
Clinical Surgery (Tuesdays and Thursdays)	Dr. J. Argyll Robertson	1 P.M.

LANGUAGES.

Greek Language and Literature (Ancient and Modern)	Mr. Negris	Junior 9 A.M.; Senior 10 A.M.; Superior 2 P.M.
Scriptures and Greek Fathers (on Saturdays)	Mr. Negris	Junior 10 A.M.; Senior 11 A.M.
Arabic and Persian, Hindustani, &c.	Mr. Ballantyne	1 P.M.
French (Mondays, Wednesdays, and Fridays)	Mr. Chaumont	7 P.M.
German (Do. Do.)	Mr. Kombst	6 P.M.
Italian (Tuesdays and Thursdays)	Mr. Rampini	6 P.M.

COURSES of LECTURES on the LANGUAGES and LITERATURE of FRANCE, GERMANY, and ITALY, &c., will be delivered towards the close of the Session.

A Reading-Room, containing the principal British and Foreign Medical and Scientific Journals, will be open for the use of the Students at the beginning of the Session.

FEES.

Fees to each of the above Courses:—First Course, 3*l.* 5*s.*; Second Do. 2*l.* 4*s.*; Perpetual, 5*l.* 5*s.*, with the following exceptions:—Greek,—3*l.* 3*s.* each Course; Scriptures, 1*l.* 11*s.* 6*d.*; Both, 2*l.* 4*s.* Anatomy,—First Course, 3*l.* 3*s.*; Second Do. 3*l.* 3*s.*; Perpetual, 6*l.* 6*s.*

Practical Anatomy,—1*l.* 1*s.* each Course of Three Months.
Natural Philosophy,—Six Months' Course, 3*l.* 3*s.*
Practical Mechanics,—First Course of Three Months, to those attending the Lectures, 2*l.* 2*s.*; Second, 1*l.* 1*s.*; to those not attending the Lectures, 2*l.* 3*s.* and 2*l.* 2*s.*
Forensic Medicine, Mineralogy and Geology, and Modern Languages, 2*l.* 2*s.* each.

Prizes and Honorary Certificates will be given by each Lecturer, and by the College, to the most distinguished Students.

Attendance at Medical Classes in Queen's College qualifies for Graduation at the University of London, and at the Universities of Oxford, Cambridge, St. Andrews, and Aberdeen; and for Examination at the Royal Colleges of Surgeons of London, Edinburgh, and Dublin; the Apothecaries' Hall; the Faculty of Physicians and Surgeons of Glasgow; and the Army and Navy, and other Public Boards.

Licentiates of the Veterinary School are eligible for appointments in the Army, and East India Company's Service.

SUMMER SESSION.

The following Subjects will be taught:—NATURAL PHILOSOPHY, PRACTICAL MECHANICS, CHEMISTRY, PRACTICAL CHEMISTRY, PRACTICAL ANATOMY and OPERATIVE SURGERY, MIDWIFERY, BOTANY, FORENSIC MEDICINE, and the MODERN LANGUAGES.

17, Dublin-street, 19th Sept. 1840. JOHN ROBERTSON, Solicitor, Secretary to the College.

MANCHESTER NEW COLLEGE, IN CONNEXION WITH THE UNIVERSITY OF LONDON.

Sir BENJAMIN HEYWOOD, Bart. President.

The COLLEGE will OPEN for the ADMISSION of STUDENTS on the 5th OCTOBER next, in Grosvenor-square, Chorlton-upon-Medlock. The Committee solicit the attention of the public to the Course of Instruction provided in the *Literary and Scientific Department*, viz.:—

I. Greek and Latin Languages; Lectures on the Grammatical Structure of the English Language, with Exercises in English Composition, F. W. NEWMAN, Esq. B.A., late Fellow of Balliol College, Oxford, and Classical Tutor in Bristol College.

II. Pure and Mixed Mathematics, R. FINLAY, Esq. B.A., Trinity College, Dublin.

III. Ancient and Modern History, and the History of Literature, Rev. JOHN KENRICK, M.A.

IV. Mental and Moral Philosophy, and Political Economy, Rev. J. MARTINEAU, of Liverpool.

V. Physical Science and Natural History, MONTAGUE L. PHILLIPS, Esq.

The entire Course will comprise three Sessions of nine months each, extending from the beginning of October to the end of June. The Classes of the first year will be occupied in preparing for Matriculation at the University of London; those of the second and third years, in preparing for the Degree of Bachelor of Arts. Students will be admissible into the College on the completion of their fifteenth year. Those who enter with a view to graduation will be required to undergo an examination in Classics and Mathematics previous to admission, and to submit to the prescribed exercises and examinations during the whole course; but the Classes will be open to other students, with whom submission to such exercises and examinations will be optional.—A detailed statement of the course of study, with a list of fees, is published, and may be obtained at the principal Booksellers in Manchester and Liverpool; or on application personally to the following Members of the Committee:—

Samuel Robinson, Esq. Dukinfield.
J. Aspinal Turner, Esq. Cross-street, Manchester.
Robert Worthington, Esq. No. 8, Princess-street, Manchester.
James Heywood, Esq. Acresfield, near Manchester.
Rev. W. Gaskell, Dover-street, Chorlton-upon-Medlock.
Samuel D. Darbishire, Esq. Marsden-street, Manchester.

Or by letter to the Secretaries, to the care of S. D. Darbishire, Esq.

Manchester, Sept. 15, 1840.

MIDDLESEX HOSPITAL SCHOOL of MEDICINE.—The WINTER SESSION will commence on THURSDAY, October 1, 1840.

ANATOMY, PHYSIOLOGY, DEMONSTRATIONS, and DISSECTIONS, by E. W. Tuson, F.R.S., Mr. Erasmus Wilson, and Mr. Lonsdale.
MEDICINE, by J. Copland, M.D. F.R.S., and F. Leighton, M.D.
SURGERY, by H. Mayo, F.R.S.
MIDWIFERY, by J. North, F.L.S.
MATERIA MEDICA, by Mervyn Crawford, M.D.
CHEMISTRY, by Mr. Everitt.
FORENSIC MEDICINE, by Mr. C. De Morgan.
BOTANY, by Mr. Meade.
CLINICAL MEDICINE, by Dr. Hawkins, Dr. Watson, and Dr. Wilson.
CLINICAL SURGERY, by Mr. Mayo, Mr. Arnott, and Mr. Tuson.

Perpetual Fee to the whole of the Lectures 45*l.*

The INTRODUCTORY ADDRESS on the opening of the Session will be delivered by Herbert Mayo, F.R.S. on Thursday, October 1st, at Two o'clock.

A Public Distribution of Prizes will take place at the termination of the Winter Session.

The Museum, Library, and Reading-room, are open for the use of the Pupils.

For further particulars apply to the Secretary of the Hospital.

BOARD and RESIDENCE for YOUNG LADIES in a delightful and healthy part of Camberwell.—A Lady and her Sisters, who have had the advantage of a superior education, and move in genteel society, would be happy to receive TWO or THREE YOUNG LADIES, who would like to join a cheerful family circle, chiefly devoted to Music and Literary pursuits. For Terms, and other particulars, apply to Mrs. Dean, 10, Red Lion-square; if by letter post free.

TO MR. VAN VOORST, Paternoster-row, Publisher of 'The Illustrations of Shakspeare's Seven Ages.'

Sir,—Having been informed that we have done wrong in publishing from the above work a Card with the following Illustrations:—

Sir David Wilkie's	'Infant.'
Mr. Collins's	'Schoolboy.'
Mr. A. E. Chalon's	'Lover.'
Mr. Abm. Cooper's	'Soldier.'
Sir Augustus Calcott's	'Justice.'
Mr. Edwin Landseer's	'Pantaloon.'
Mr. Hilton's	'Last scene of all.'

We hereby agree, in consideration of your consenting to stay proceedings at law against us for such infringement of your copyright, to give up the plate and all the impressions now in our possession, and to pay your solicitor's charges.

JOHN SMITH.
JAMES SMITH.

Witness, 10, King-street, Snow-hill.
RICHD. COMINS, Sept. 8th, 1840.
7, Warwick-court, Gray's Inn,
Solicitor for Mr. Van Voorst.

Next Wednesday, with the Magazines, will be ready, in 3 vols. with Illustrations by Herrlein,

LADY BULWER'S BUDGET OF THE BUBBLE FAMILY; A NOVEL.

"Bubble, bubble, toil and trouble."—*All the Witches.*

*** All orders for this work should be given at the Libraries and Booksellers' throughout the United Kingdom, in order to obtain it punctually on the day of publication.

Edward Bull, Publisher and Librarian, 19, Holles-street, Cavendish-square.

MONTHLY CATALOGUES OF OLD BOOKS.

Now ready,

THE SHEET CATALOGUE for the Present Month, containing many valuable and curious Articles now offered for Sale by JOHN BRYANT, the Camden Head, 9, King William-street, West Strand, London.

Parties desirous of having the Catalogues forwarded on the day of publication, are requested to hand their addresses, when they will be sent *postage free*.

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The terms both for Fire and Life Assurance will be found to combine all the advantages offered by other Companies. Prospectuses may be had at the Offices, King William-street, London, and High Ousegate, York; or of any of the Agents.

J. REDDISH, Sec.

UNITED KINGDOM LIFE ASSURANCE COMPANY, 8, Waterloo-place, Pall Mall, London.

The first Septennial Division of Profits of this Company will be declared in the ensuing year on all Policies of the participating class effected previous to the 31st December, 1840. Parties, therefore, who wish to Insure their Lives, should avail themselves of the opportunity they now have of sharing in the bonus so soon to be declared by immediately making proposals.

The following are the Annual Premiums for the assurance of 100*l.* for the whole period of life, on which half credit may be allowed for five years; which credit may remain at five per cent. interest, to be deducted at death from the sum insured:—

Age.	Without Profits.	With Profits.
20	£1 13 10	£1 18 6 per Cent.
30	2 3 10	2 8 3
40	2 19 1	3 3 4
50	4 6 0	4 10 7

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Age to be attained.	Seventy.	Seventy-five.	Eighty.
Age when assured,	20 £2 6 1	£2 2 4	£2 0 0
	30 3 2 10	2 15 2	2 10 6
	40 4 19 0	4 0 3	3 9 7
	50 10 14 10	7 8 1	5 12 3

EXAMPLE.—A person aged 30, by paying an annual premium of 2*l.*, becomes entitled to 100*l.* on his attaining the age of 70, or to the same sum should he die before arriving at that age.

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Every information will be afforded on application to the Resident Director, Edward Boyd, Esq., No. 8, Waterloo-place. Proposals may be accepted on Wednesday at 3 o'clock, and any other day appearance may be made at half-past 3 o'clock, when Frederick Hale Thomson, Esq., the Company's Surgeon, is in attendance.

EDWARD LENNOX BOYD, Sec.

THE YORKSHIRE FIRE and LIFE INSURANCE COMPANY, established at YORK, 1824, empowered by Act of Parliament.—Capital, 500,000*l.*

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The Terms of this Company for LIFE INSURANCES will be found on comparison to be the lowest which can be taken with safety, and particularly for FEMALE LIVES, the lowest charged by any Office in the Kingdom.—The following extracts from the Tables (copies of which, with the Rates for the intermediate Ages, may be had on application at the Office in York, or any of the Agents,) will show the Annual Premiums required for securing 100*l.*, payable on the decease of

A MALE.

Age next Birthday.	Premiums for One Year.	Premiums for Seven Years.	Premiums for Whole Life.
30	£0 17 4	£0 18 4	£1 14 4
40	1 12 6	1 16 3	2 19 6
60	3 10 9	4 8 0	6 6 6
75	9 16 0	11 10 6	13 4 4

A FEMALE.

30	£0 17 2	£0 18 4	£1 11 6
40	1 5 6	1 7 3	2 13 0
60	2 18 0	3 9 3	5 12 6
75	13 1 7	15 10 0	13 12 10

Table of Premiums payable for a *fixed number* of years *only.*

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Age next Birthday.	Annual Premiums payable for 10 Years only.	Annual Premiums payable for 15 Years only.	Annual Premiums payable for 20 Years only.
30	£2 7 9	£2 3 6	£2 19 6
40	4 4 0	4 12 6	3 17 4
50	7 6 4	5 11 0	4 13 4

A FEMALE.

30	£1 3 0	£1 3 0	£2 9 9
40	2 13 8	2 19 10	3 9 8
50	6 17 2	5 3 0	4 7 0

Table of Premiums payable on a Seven Years' *ascending Scale.*

A MALE.

Age next Birthday.	Annual Premiums payable first 7 Years.	Annual Premiums payable second 7 Years.	Annual Premiums payable for remainder of Life.
20	£1 4 0	£1 9 4	£2 3 0
40	2 8 9	3 1 3	3 8 4
50	3 2 6	3 19 0	5 12 0

A FEMALE.

20	£1 4 0	£1 5 6	£1 16 8
40	1 16 10	2 7 0	3 6 2
50	2 11 3	3 4 6	5 9 0

Premiums payable on a Seven Years' *descending Scale.*

A MALE.

Age next Birthday.	Annual Premiums payable first 7 Years.	Annual Premiums payable second 7 Years.	Annual Premiums payable for remainder of Life.
20	£2 3 10	£1 14 6	£1 7 9
40	3 19 6	2 19 9	2 1 0
50	5 6 6	4 1 9	2 3 6

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40	3 9 4	2 12 0	1 17 7
50	4 17 8	3 13 3	2 3 9

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Members whose premiums become due on 1st October next, are hereby informed that the same must be paid within thirty days from that time.

JOSEPH MARSH, Secretary.

SCOTTISH UNION FIRE and LIFE INSURANCE COMPANY, No. 449, West Strand, and No. 78, King William-street, Mansion House, London; George-street, Edinburgh; and Dame-street, Dublin.

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Tables of Rates and every information may be had at the Company's Offices; or of the Agents throughout the Kingdom.

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SCOTTISH UNION FIRE INSURANCE COMPANY.

EXTRACT from the Returns printed by order of the House of Commons, showing the amount of FIRE INSURANCE DUTY paid into the Exchequer for the year 1839, by the following Insurance Companies carrying on the business of Fire Insurance in LONDON. Also the Farming Stock (which is free of duty) insured in the same period by each Company respectively.

	Total duty paid, 1839.	Sum insured on Farming Stock, exempt.
Sun	£158,689 15 2	£6,747,495
Phœnix	130,151 0 1	4,742,405
Royal Exchange	68,876 17 9	4,643,589
Norwich Union	66,574 5 6	3,452,178
County	45,100 7 5	6,482,414
Guardian	34,918 7 9	582,295
Globe	33,222 3 4	1,032,853
West of England	32,424 10 0	986,369
Imperial	32,323 6 9	319,249
Alliance	25,513 8 11	579,817
Atlas	25,122 2 4	905,157
SCOTTISH UNION*	20,502 5 10	837,683
Westminster	18,663 1 5	26,850
British	13,349 10 0	646,774
Union	13,212 10 1	235,367
London	13,250 13 2	150,807
York and London	11,584 15 4	600,209
Hand-in-Hand	10,936 2 2	—
Licensed Victuallers	5,210 9 10	—
Protestant Dissenters	3,940 15 8	74,485
Independent and West Middlesex	2,073 6 7	76,700
Benevolent	13 3 2	—

* Offices in London, No. 449, WEST STRAND, and No. 78, KING WILLIAM-STREET, CITY, where Insurances may be effected against Fire on the most liberal terms.

No charge made for Policies, or for Alterations and Removals.—Insurances effected for Seven Years charged Six Years only.—The Rates required by the Scottish Union Life Office on Young and Middle-aged Lives are considerably lower than those charged by most other Offices.

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The Directors hereby give notice to Members whose Premiums fall due on the 5th of October next, that the same must be paid within thirty days from that date.

The premiums are payable yearly, half-yearly or quarterly, on the 5th of January, 5th of April, 5th of July, and 5th of October, either of which several days constitutes the commencement of the year to Members. Persons, therefore, desirous of entering the Society, as Members, on the 5th of October next, should appear at the Office on or before that day.

Examples of the abatement of Forty per cent. already allowed on Members' Policies of Five Years' standing.

Date of Policy.	Age.	Sum Assured.	Annual Premium paid for first 5 years.	Premium on sixth payment.	Reduction of Premium 6th year.	would assure, at the increased age of the party.
1835, 5th Jan.	36	£ 3000	£. s. d. 88 12 6	£. s. d. 53 3 6	£. s. d. 35 9 0	£. 1635
	46	3000	113 6 8	68 0 0	45 6 8	963
	52	1000	71 8 4	42 17 0	28 11 4	390
18th March,	30	1000	24 17 6	14 18 6	9 19 0	345
	41	5000	171 0 10	102 12 6	68 8 4	1655
	50	3000	141 15 0	85 1 0	56 14 0	1040

The above shows a result admitting of advantageous comparison with any other institution for Life Assurance. All Members' Assurances effected during the year 1835 and the early part of 1836, have received the above rate of abatement, which has been made upon data justifying a confident expectation that the same reduction at least will be continued to those Members, and that all others, after having paid five annual premiums, will become entitled to an equal abatement.

A reduced Table of Rates for Assurances not claiming profit.

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Princes-street, Bank, 19th Sept. 1840.

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Premium for assuring 100*l.*

Age.	£ s. d.	Age.	£ s. d.	Age.	£ s. d.
25	1 18 6	35	2 10 11	45	3 9 4
30	2 4 4	40	2 18 8	50	4 4 8

Deferred Annuities Department.

By the plan exclusively developed by the Society, a single Deferred Annuity is made, not only to answer the same object but to equal in amount the entire sum of all the advantages heretofore only obtained by the middle and industrious classes by separate investments in Savings Banks, Benefit Societies, and Loan Banks.

1. A small yearly, or weekly contribution, will secure the most ample return for after life; thus—2*l.* 12*s.* per annum (1*s.* a week) at 20, will, at 65, give the policy holder the choice of an annuity for life of 47*l.* 16*s.* 6*d.*; 364*l.* 11*s.* in cash; or Policy without further contribution, of 466*l.* at death.

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EDINBURGH REVIEW, No. 145.

ADVERTISEMENTS intended for insertion in this forthcoming Number of the Edinburgh Review are requested to be sent to the Publishers on or before TUESDAY, Sept. 29; and BILLS on or before FRIDAY, October 2.

39, Paternoster-row.

THE QUARTERLY REVIEW, No. CXXXII., is published THIS DAY.

Contents:

I. The Fine Arts in Florence.
II. Acland on the Plain of Troy.
III. Modern English Poetesses—Mrs. Norton—Miss Barrett—Lady Emmeline Wortley—Mrs. Brooke, &c. &c. &c.
IV. Wrangell's Expedition on the Polar Sea.
V. Works of Thomas Carlyle—Chartism—French Revolution, &c.
VI. Life of Niebuhr, the Historian.
VII. The Crown Prince George of Hanover on Music.
VIII. Memoirs of Sir Samuel Romilly.

John Murray, Albemarle-street.

On Wednesday next will be published,

THE ECLECTIC REVIEW for OCTOBER.

Contents:

1. Memoirs of Sir Samuel Romilly.
2. Murray's Treatise on Depression Demonstrated.
3. Lieber's Manual of Political Ethics.
4. The Epistle to the Romans—Haldane and Chambers.
5. Religious Persecution in Madagascar.
6. Pascal.
7. The Claims of Home and Colonial Missions.
8. The Niger Expedition.

London: Ball, Arnold, & Co. 34, Paternoster-row.

This day is published,

BRITISH AND FOREIGN REVIEW, No. XXI.

1. Chartism and Church Extension.
2. Austria and her Resources—Milan Treaty.
3. Modern French Novelists—Le Noud Gordien.
4. Montenegro.
5. British Administration of India.
6. Medical Reform.
7. History of Fiction—Eastern Story-Tellers.
8. History and the Hungarians.

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4. Sermons, preached at Cambridge in 1837. 3rd edition, 8vo. 5*s.*
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By HENRY MELVILL, B.D.
Minister of Camden Chapel, Camberwell; and late Fellow and Tutor of St. Peter's College, Cambridge.

Rivingtons, St. Paul's Churchyard, and Waterloo-place.

LONDON, SATURDAY, SEPTEMBER 26, 1840.

TENTH MEETING OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

[*From our own Correspondents.*]

THURSDAY, SEPTEMBER 17.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

President—Prof. FORBES.

Vice-Presidents—G. B. AIRY, Esq., Astron. Royal, Rev. Prof. WHEWELL, Prof. J. THOMSON.

Secretaries—Prof. STEVELLY, Rev. Dr. FORBES, Mr. A. SMITH.

Committee—Dr. Neill Arnot, Dr. Anderson, Mr. F. Baily, Sir D. Brewster, Sir T. Brisbane, Mr. J. Caldecott, Prof. Duncan, Mr. J. P. Emy (Philadelphia), Prof. Encke (Berlin), Mr. T. Galloway, Capt. Johnson, R.N., Rev. Prof. Kelland, Dr. Lamont (Munich), Prof. Nichol, Mr. A. F. Osler, Mr. J. Phillips, Capt. R. E. Pringle, Rev. Dr. Robinson, Mr. J. S. Russell, Major Sabine, Col. Sykes, Mr. W. F. Talbot, Prof. Wallace, Prof. Wheatstone, Prof. Willis.

THE PRESIDENT, on taking the chair, observed that the ordinary course pursued on opening the Section was to call on those who had been appointed at previous meetings to draw up reports, to say whether those reports were now ready, or what progress had been made. In conformity with this practice, he begged to know from Major Sabine whether the Report on Magnetism, by Sir John Herschel, had arrived.

Major SABINE replied that it had not, but as soon as it reached him he would communicate it to the Section.—Major Sabine then presented his 'Report on the Translation of Foreign Memoirs.'—At the Meeting of the British Association at Newcastle, in 1838, a Committee was appointed for the purpose of procuring and publishing translations of foreign scientific memoirs, and a sum of 100*l.* was placed at their disposal: and at the Meeting at Birmingham, 1839, a further sum of 100*l.* was allotted for the same object. The memoirs translated in the first year, under the superintendence of the Committee, and at the expense of the Association, were:—

1. 'Remarks on the advancement of Magnetical Observatories, and a Description of the Instruments to be placed in them,' (with one plate,) by Weber.
2. 'Method to be pursued during the Magnetical Term Observations,' by Gauss.
3. Extract from the Daily Observations of Magnetic Declination, during Three Years at Göttingen, by Gauss.
4. Description of a small Portable Apparatus for Measuring the Absolute Intensity of Terrestrial Magnetism, (with one plate,) by Weber.
5. 'On the Graphical Representation of the Magnetic Term Observations,' (with two plates,) by Gauss.

For the translation and publication of these in Taylor's Scientific Memoirs, the first year's grant of 100*l.* was paid to Mr. Taylor. In the present year Ohm's memoir, entitled, 'The Galvanic Circuit investigated Mathematically,' has been translated at the expense of the Association, and given to Mr. Taylor, for the seventh and eighth numbers of the 'Scientific Memoirs.' The Association have also paid for seven plates, representing the lines of magnetic declination, inclination, and intensity, computed by M. Gauss's theory. The sums paid for these plates, and for the translation of Ohm's Memoir and the plate which accompanies it, amount to 63*l.*, which is the whole charge for the present year. The Committee stated that translations have been gratuitously presented to the Committee, of the seven undermentioned memoirs on magnetical instruments and on subjects of prominent interest in mathematical and physical science:

1. Gauss 'On a New instrument for the Direct Observation of the Changes of the Intensity in the Horizontal Portion of the Terrestrial Magnetic Force.'
2. Weber 'On the Arrangement and Use of the Bifilar Magnetometer.'
3. Gauss, 'General Theory of Terrestrial Magnetism.'
4. Encke 'On the Method of Least Squares.'
5. Bessel 'On the Determination of the Axes of the Elliptic Spheroid of Revolution which most nearly corresponds to the Existing Measurements of Arcs of the Meridian.'
6. Weber, 'Description and Use of a Transportable Magnetometer.'
7. Bessel 'On the Barometrical Measurement of Heights.'

The Committee placed these translations in the hands of Mr. Taylor, by whom they have been printed in the sixth, seventh, and eighth numbers of the 'Scientific Memoirs.' The Committee further acknowledged the receipt of a translation of Rudberg's 'Experiments on the Expansion of Air,' gratuitously presented by Prof. Miller, of Cambridge. This translation has also been placed in Mr. Taylor's hands, and makes a part of the eighth number of the 'Scientific Memoirs.'

In the absence of Prof. Powell, Prof. Whewell laid before the Section an abstract of 'Prof. Powell's Report on Radiant Heat.' This report was supplementary to one furnished by Prof. Powell to the Association at the Oxford Meeting, in 1832, and he now proposed to give an account of the progress of discovery since that period. Such a report was peculiarly required, from the number and importance of the results arrived at in the interval, which, though not sufficient to form the basis of an unexceptionable theory, have at least tended greatly to modify previous opinions, and to enable us to refer large classes of phenomena to something like a simple and common principle. The former report was divided into various heads, derived from what appeared in the then existing state of our knowledge well-marked distinctions between several kinds of effects ascribed to radiant heat: but recent discoveries have in a great degree so changed our views on the subject, that these divisions cannot with any advantage or convenience be adhered to. One principle of arrangement, however, has been newly supplied in the discovery of the polarization of heat; so that all the researches to be described may be conveniently classed under two heads,—1st, as they relate to heat in its *ordinary* or *unpolarized* state; 2ndly, as they relate to *polarized heat*. The Report then entered on the first general head, by calling attention to the recent researches of Melloni and Forbes, respecting the *transmission* and *refraction* of heat. The Professor adverted to the discovery of Melloni, that the resistance to the passage of heat is *not* exerted at the surface, but in the interior of the mass. This was a result of the observation, that the difference between the transmission of heat from a more highly heated source and from a less highly heated source became less as the thickness of the screen was diminished, and disappeared when very thin screens were interposed. By comparing the transmissive powers of a great number of substances, he found that in crystallized bodies the diathermaneity for the rays of a lamp was proportional to their refractive powers; but in uncrystallized bodies no such law could be traced. It was in the course of these researches that Melloni made the important discovery of the singular property possessed by rock-salt,—viz., that it is almost entirely permeable to heat, even from non-luminous sources. He found its transmissive power six or eight times greater than that of an equal thickness of alum, which had nearly the same transparency and refractive power; and that, unlike other diathermanous media, it is *equally* diathermanous to every species of heat, *i. e.* whether from sources highly heated or moderately heated; thus, he found a plate of 7 millimetres (.28 inch) thick to transmit 92 out of 100 rays, whether from flame, red hot iron, water at 212° or at 120° Fah. A plate one inch thick gave a similar constant ratio: the general conclusion being, that the source being a lamp, the diathermancy is not proportional to the transparency; and he makes some general remarks on these results, as related to those of Seebeck, on prismatic dispersion. In a supplementary paper, Melloni investigates the modifications which calorific transmission undergoes in consequence of the radiating source being changed. He employs four sources of heat,—1, a Locatelli lamp; 2, incandescent platina; 3, copper heated by flame to about 730° Fah.; 4, hot water in a blackened copper vessel. The discovery of the complete diathermancy of rock-salt furnished the means of prosecuting the author's researches on the refraction of heat. In the successful experiment which he made, he concentrated in the focus of a rock-salt lens, the rays of dark heat from hot copper and hot water. A similar lens of alum produced no effect, which proves that the effect is not due to the mere heating of the central part of the lens. In discussing the properties of the calorific rays immediately transmitted by different bodies, a remarkable effect presented itself: the rays of the lamp were thrown upon screens of different substances in such a manner that, either by changing the distances or by concentration with a mirror or a lens of rock-salt, the effect transmitted from all the sources was of a certain constant amount. This constant radiation was then intercepted by a plate of alum, and it was found that very different proportions of heat were transmitted by the alum in the different cases; from whence he (Melloni) concludes "that the calorific rays issuing from the diaphanous screens are of different qualities, and possess (if we may use the term,) the diathermancy peculiar to each of the substances through which they have passed." He next investigated the effects of *coloured glasses*, and concludes, that all the coloured glasses except green produce no "elective action" on heat: green glass, on the contrary, transmits rays more easily stopped than the others: and that green glass is the only kind which possesses a coloration for heat (if we may use the term), the others acting upon it only as more or less transparent glass of uniform tint does upon light. From experiments upon the solar rays transmitted by green glass, and intercepted by other media, he found they passed copiously through rock-salt, but feebly through alum; whence he concludes, that there are among the solar rays some which resemble those of terrestrial heat, and in general that the differences observed between solar and terrestrial heat, as to their properties of transmission, are therefore to be attributed merely to the mixture in different proportions of these several species of rays. Prof. Forbes repeated and extended Melloni's experiments on the transmission and refraction of heat. One of the most interesting points to which he directed his attention was the possibility of detecting heat in the moon's beams. These, concentrated by a polyzonal lens of thirty-two inches diameter, and acting on the thermo-multiplier, gave no indication of any effect: so that Prof. Forbes considers it certain that, if there be any heat, it must be less than the $\frac{1}{30000}$th part of a degree Centigrade. In his third section he investigates the index of refraction for heat of different kinds as compared with that for light in the same medium. The method of observation adopted was indirect, depending upon the determination of the critical angle of total internal reflection in a rock-salt prism with two angles of 40° and one of 100°. By an ingenious mechanical contrivance, the sentient surface of the pile was made to receive rays coming from the source of heat after undergoing two refractions and one reflection, whatever was the angle of incidence. The results, which were but approximate, were as follows:—

Source of Heat.	Index of Refraction for Rock-salt.
Locatelli Lamp	1.521
Do. transmitted through Alum ..	1.546
.. .. Glass	1.537
.. .. Opaque Glass ..	1.543
.. .. Opaque Mica ..	1.533
Incandescent Platina	1.522
Do. transmitted by Glass	1.536
.. .. Opaque Mica ..	1.534
Brass at 700°	1.518
Do. transmitted by Clear Mica ..	1.527
Mercury at 450°	1.522
Mean luminous rays	1.552

The results deduced are:—

1. The mean quality, or that of the more abundant proportion of the heat from different sources, varies within narrow limits of refrangibility.

2. These limits are very narrow indeed where the direct heat of any source is employed.

3. All interposed media (including those impermeable to light), so far as tried, *raise* the index of refraction.

4. All the refrangibilities are inferior to that of the mean luminous rays.

5. The limits of dispersion are open to further inquiry, but the dispersion in the case of sources of low temperature, appears to be smaller than that from luminous sources.

The report then went on to the researches of Melloni on the reflection of heat; and the analogies of light and heat, as traced by Forbes and Melloni. He dissents from the opinion of Ampère, that the difference between heat and light is to be accounted for by the difference of wave length on the undulatory hypothesis. During these researches, he found that a certain kind of green glass coloured by oxide of copper, though it permitted a portion of luminous rays to pass, absorbed all the calorific rays, so that it exhibited no calorific action, capable of being rendered perceptible by the most delicate thermoscope, even when so concentrated by lenses, as to rival the direct rays of the sun in brilliancy. With respect to the transmission of heat by screens, Prof. Forbes remarked, that Melloni's view of the transmission of heat of low temperature, by all substances alike, is equivalent to saying that substances in general allow

only the more refrangible rays to pass, or that while rock-salt presents the analogy of white glass, by transmitting all rays in equal proportions, every substance hitherto examined acted on the calorific rays as violet or blue glass does on light, absorbing the rays of least refrangibility, and transmitting the others only. To this rule, Melloni made out the first exception, or the first analogue to red glass—rock-salt with its surface smoked. And Prof. Forbes soon after pointed out another, viz. mica split by heat into numerous fine laminæ, and from hence, as the effect was obviously mechanical, since unlaminated mica produces no such effect, he concludes that the smoked surface of the rock-salt acted also mechanically, and was thus led to try the effects of surfaces variously altered by mechanical means, and thus effects, in some distant degree analogous to *sifting* the heat, were observed. Fine powders also sifted on the surface, were found to affect the transmission of heat; and these Prof. Forbes considered analogous to diffraction and periodic colours in light. From these important researches, we have learned to connect modifications in the transmission of heat with the quality of refrangibility, and not as heretofore with a supposed difference of quality depending on the *source* of the heat. The report then gave an account of the researches of Dr. Hudson on radiation of heat, those of President Bache and Stark on the influence of colour and surface on radiation, and Prof. Powell's experiments upon the repulsive power of heat; and adverted to Mr. Farquharson's theory of the formation of ice at the bottom of rivers, as a result from radiant heat. From this opinion, Prof. Powell dissents. The report then proceeds to the second division, on polarized heat, under which a detailed history of the several successive discoveries of Prof. Forbes on this subject was minutely given, with the dates of the several stages of the discoveries. Melloni having failed in repeating the experiments of Berard in polarizing heat by the tourmaline, and Nobili having in vain attempted it by reflection, Mrs. Somerville in her 'Connexion of the Physical Sciences,' 2nd edition, speaks of it as altogether without experimental proof. In November 1834, Prof. Forbes took up the subject, and obtained complete success. He succeeded in polarizing heat from various sources, and by the aid of various substances, as piles of plates of mica, and by reflection and refraction, and showed that the peculiar modification of the experiments adopted by Berard, by reflection from glass, the quantity even at the maximum which could reach the thermoscope after two reflections, would be so extremely small, as that no difference of effect in the two rectangular positions could really have been perceptible. The entire series of those discoveries was completed between November 1834 and January 1835, the main practical improvement (which led to all the rest of the discoveries,) being the employment of the piles of mica. Prof. Forbes being at Paris in the summer of 1835, and finding both Biot and Melloni sceptical as to these results, he exhibited them to those philosophers with mica piles, which he prepared for the occasion, and which he left with Melloni. The next subject entered upon by Prof. Forbes was, that of circular and elliptic polarization. This he determined both by depolarization, and also by the internal reflection of heat in a rhomb of rock-salt, as in the analogous cases of circular polarization of light. The report then adverted to the researches of Melloni on polarized heat, and entered minutely into historical details, and the theoretic views of the author; and then pointed out some expressions in Dr. Thomson's work on heat, which might lead a person, who did not carefully attend to dates and facts, to attribute the priority of discovery to Melloni, and thus to deprive Prof. Forbes of a portion of his well-earned fame; and which was so clearly his due, that in 1836 the Keith prize had been awarded to him by the Royal Society of Edinburgh, after a close examination of the researches and experiments by the council; and subsequently the Rumford medal was adjudged to him by the Royal Society of London, after similar precautions. The later researches of Forbes and Melloni on this subject related to the connexion of these discoveries, and the facts thus developed, with the undulatory theory. The report contained some remarks on the clearness with which the chronological order of the discoveries is marked in this case, and the consequent impossibility of any of those disputes which have sometimes tended to disturb the harmony of scientific inquiries. The continental philosophers have the merit of devising and bringing to perfection the instrument by the aid of which alone, any discoveries in this very delicate field of research could have been expected. Prof. Forbes is the author of the discovery of the polarization of heat in all its branches, and from all its sources. The report concluded, by drawing attention to the difference which exists between Prof. Forbes and the continental philosophers, as to the equal or unequal polarization of heat from different sources, and to the speculations respecting the cause of the variety of action of light and heat on our organs of sense, while both originate in undulations of the molecules of the same ethereal medium.

Prof. Forbes stated, that with respect to the difference of opinion alluded to, he believed he might safely announce that it was at an end, as in a late interview which he had with those distinguished persons, the cause of the discrepancy, he believed, had been detected, and the question settled to the satisfaction of all concerned.—Prof. Stevelly inquired of Prof. Forbes, how, if these researches should lead to the adoption of the undulatory theory for heat as well as for light, that hypothesis could be reconciled with the quantitative measures of heat which chemistry forced upon our notice? for although the density of light might be treated as a quantity, yet he did not see how colour, to which heat was thus rendered analogous, could.—Prof. Forbes said, that in his researches, he had not at all entered into the discussion of the facts, with a view either to the establishment or disproof of any physical theory of the nature of heat, and although he had little doubt of the conclusion which these facts would ultimately force upon us, yet, as he saw Profs. Kelland and Whewell, and others present, who, by their attention to the mathematical investigations connected with these subjects, were so much better qualified to give an answer than he was, to them he begged to refer it.—Prof. Kelland said, that he had given some, but not much attention to the subject to which the question referred. He had no doubt but that the undulations were distinguished by something analogous to what had been called faces, and that while the undulation in a direction perpendicular to its direction of propagation, was a circular function, and therefore tended to compensate or return into itself, in the direction in which it was propagated; on the other hand it was not circular, and thus admitted of quantitative increase or diminution. Now, it was to the length of the wave in the direction of its propagation, that analogy would lead us to attribute its heating influence.—Prof. Whewell said, he was inclined to answer the question rather differently from Prof. Kelland, although that answer would be quite satisfactory, if the hypothesis of faces, or particular aspects of the heating rays, should be confirmed by other phenomena. The answer, however, which he should be inclined to give was, that before the difficulty was attempted to be met directly, we should settle what was meant by quantity of heat: what that was, in short, which our thermometers indicated; for his part, he conceived, that if our photometrical instruments had been fitted up to indicate degrees in the way that our thermometers are, we should have spoken just in the same way, and nearly in similar terms, of quantities of light, as we now do of quantities of heat, indicated in both cases by degrees; and since it was admitted that the one offered no solid barrier to the adoption of the undulatory theory of light, neither would the other be found, when examined strictly, to oppose in any formidable degree the undulatory theory of heat. In his opinion, the phenomena of conduction would be found to present a more serious objection to the application of the undulatory theory to heat. That undulations among an ether of such extreme tenuity as that of light or heat, should be propagated onwards in directions different from those in which the original radiant undulations were being propagated, and that by some influence of the grosser particles of bodies which must be supposed as it were imbedded in this fluid, was, he conceived, a difficulty which would require to be considered, but which he was, however, far from conceiving as insuperable. Ampère's theory, he conceived, removed these difficulties. He would beg to ask Prof. Forbes, how he accounted for the curious fact, that although the length of the wave of heat was nearly three times that of light, [illegible] their refractive indices were so nearly the same?—Prof. Forbes replied, that a communication from Prof. Powell, which was among the list of papers to be read in this day's proceedings, would give an answer to the inquiry of Prof. Whewell; and, therefore, if the Section would permit him to change the order in which it was set down, he would lay it now before them, and thus keep the subjects continuous.

'On a Point in the Wave-theory as applied to Heat,' by Prof. Powell.

According to M. Cauchy's theory, the relation between the refractive index and the wave length is expressed by the formula,

$$\frac{1}{\mu^2} = P - Q\left\{\frac{\pi\Delta x}{\lambda}\right\}^2 + R\left\{\frac{\pi\Delta x}{\lambda}\right\}^4 - \&c.$$

And when λ is very great compared with Δx, this expression is reduced to its limiting value:

$$\frac{1}{\mu^2} = P, \text{ or } \mu = \frac{1}{\sqrt{P}}$$

This forms the limit of refraction for rays of all wavelengths, *whether of light or of heat*. And as the ratio approaches this limit, considerable changes in λ will correspond only to small changes in μ. This deduction is obvious, and has been before made. The limit is easily determined from Mr. Kelland's calculation for all the media examined by Fraünhofer; thus, e. g. for flint glass, No. 13, we have

For the ray B . . . . $\mu_B = 1.6277$

For the limit . . . . . $\mu_\infty = 1.6090$

The present object is to remark the bearing of this point on the theory of *heat*. If this theory be true, all refraction of heat ought to fall within this limit, and probably a considerable portion of the heating rays would have an index not far removed from it. It will be particularly interesting to calculate it for rock-salt and other diathermanous media, and compare it with the index of the heating rays. The data for rock-salt are given in my report on refractive indices, British Association Reports, 1839. This consideration also explains a difficulty which occurred to Prof. Forbes, who, in his third series of researches, (Section 2, No. 45, 46,) having arrived at the conclusion, that a wave of heat has a length nearly three times that of red light, regards this as a startling inference, and difficult to reconcile with the small difference existing between the index of refraction for heat and for light. This is just what should result on the above theory.

Sir David Brewster said, there was another inquiry connected with the subject now under discussion, which he would beg to press on the attention of Prof. Forbes, and others who were engaged in experimental researches in this branch of physics. He should be glad to have it determined, whether any phenomena among those connected with heat were analogous to those of opalescence with respect to light. The latter were interesting and important; the intimate particles of bodies were found occasionally to exercise an important action upon light: thus, light transmitted through the fluor spar of Alston Moor was acted upon by the internal particles of these crystals, so that the blue light was abundantly reflected, and an opalescence was thus caused. The alcoholic solution, also, of many vegetables, was found to exhibit a similar effect; thus, the alcoholic solution of laurel leaves cut up, when placed in a square cut phial of clear glass, was found, when looked at in such a position as that the rays had to pass through a thick mass of the fluid, to return the red rays very abundantly, giving the entire mass of fluid a tinge of that shade, and this effect seemed to be strictly analogous to opalescence. Tabasheer was also found to be opalescent for blue light; and there were many other examples which he might cite.—Prof. Forbes replied, that he considered there were phenomena connected with heat, which bore a very close analogy to opalescence in regard to light; thus, the phenomena of mica, reduced to very thin superimposed plates, by the action of heat, he considered to be strictly analogous; also the action of smoked surfaces on heat, and surfaces covered with other powders, besides carbon, in a finely divided state, he conceived would be found to belong to the same class.—Sir David Brewster thought, that in the case of light the effect depended upon a decomposing influence exerted upon

the light by the molecules of the opalescent body through which it was passing; thus, by placing a small quantity of oil of cassia between plates of glass, a decomposing influence was exercised upon the light, and an opalescent effect resulted. Also, when white wax was rubbed between two glass plates, the influence of the interstices which were left between the waxy particles, and which were occupied by air, produced a decomposing effect, when resulted colours, as he conceived, analogous in their origin to opalescence.

Prof. Forbes now gave an abstract of his Supplementary Report on Meteorology. At the last meeting of the Association, he had been requested to make a report on the progress of meteorology since the period of his former Report, which was drawn up in 1833. In obedience to that request he now came before them. He had distributed the matter of this report under the same general heads as those under which he had formerly treated of the several subjects. These were Temperature, Pressure, Humidity, Wind, Clouds, Rain, Electricity, Meteors, and suggestions on the first of these heads. In the report, he had entered fully into the subject of the instruments used for measuring temperature, with their improvements, defects, and the cautions to be observed in using them. He enlarged on the decrease and accumulation of heat, and the curves which were used for elucidating these subjects. He spoke of the temperature decreasing in a geometrical series as you ascend through arithmetically increasing heights, the temperature being supposed constant, and entered on an examination of the paradoxical conclusion at which Poisson had arrived, that the upper surface of the atmosphere was, in consequence of the extreme cold there existing, in a state which he termed liquefaction. He observed, that there were reasons for concluding that the temperature of space itself entirely beyond the atmosphere of the earth, was not so cold as Poisson seemed to suppose the highest portions of our atmosphere; but that, independent of this opinion, there were other causes in operation quite sufficient to limit the extent of the atmosphere, without the aid of this startling supposition, and which limited height might be considered as almost established, since Wollaston's proofs derived from the two entirely unconnected sources of astronomical and chemical phenomena. He then glanced briefly at the subject of isothermal lines, and passed on to the subject of solar radiation. He examined at great length the researches of Poisson on this subject, and pointed out what he considered the inadequacy of his speculations on what may be called the astronomical part of the total influence. The chief point insisted on in this branch was, the neglect of Poisson to take into calculation the influence of the earth's atmosphere in diminishing the heating power of the sun's rays, particularly when they entered it obliquely. This he showed to be most important, by stating the fact, that at Paris the influence of the atmosphere upon rays entering vertically, being to reduce their heating influence by 25 per cent. of what it would have been had they not passed through it; when they entered so obliquely as to form an angle of 25° with the horizon, their heating influence was reduced to one-half; and when an angle of 5°, to one-twentieth part. If Poisson's views were correct, the total solar influence at Paris would be 24° Centigrade; and as the mean temperature of Paris is 11°, this would leave about 13°, or about 9° of Fah., as the temperature, irrespective of the sun's heat; whereas the mean temperature of the polar parts of the earth, which are so far from being totally deprived of solar influence, that they are alternately under that influence and deprived of it, is no higher than about 32°. He then proceeded to the consideration of the temperature of the earth below the surface—gave a sketch of the results of former experiments, originating in those made in the caves under the Observatory at Paris—detailed the results of those lately made, and promised, before the Association concluded its present sittings, to bring this subject again before the meeting, in connexion with the experiments made at Edinburgh. Then he glanced rapidly at the subject of mean temperature, and showed, that while within the tropics it was sufficient to plunge a thermometer a foot under the surface of the earth, in order to get by its mean indication the mean temperature of the place, in higher latitudes this would not be sufficient; and he detailed the circumstances producing the difference, and pointed out the methods and precautions necessary for obtaining it. He then entered on the consideration of the temperature of space beyond the earth, and stated the probable source of it to be the radiating influence of the stars. Under the head of Pressure, the barometer, its construction and proper use, came under consideration. He pointed out the use of curves in recording and comparing its indications—the great variety of its oscillations in the several parts of the earth, and alluded to the importance of accurate registers of its indications being kept,—alluding to the value of the hourly observations recorded, for so many years, under the inspection of Mr. Snow Harris, at Plymouth, and those at Leith and other places in Scotland, under the inspection of Sir D. Brewster. He next alluded to a fact which seems to lead to the inference, that we must repose less confidence in the barometer, as a means of measuring heights, than has been heretofore supposed. It has been found by actually levelling between the Black Sea and the Caspian, that the latter was only 82 feet below the level of the former; whereas barometric measurements, founded on previous determinations, since carefully repeated, gave, in consequence of some as yet unknown anomaly, the difference of 320 feet. The Humidity of the atmosphere was the next topic discussed. As to the amount of vapour in the atmosphere, at any one instant, he considered that by the researches of Dr. Apjohn, begun at the suggestion of the Association, the important problem of the wet-bulb thermometer had been completely solved, and meteorologists thus put in possession of a simple, and at the same time most effective, instrument. The subject of the distribution of humidity in the atmosphere was next briefly touched on. Under the head of Wind, he alluded to the theory of Dove, which he said was comparatively unknown in these countries; and briefly spoke of the researches of Lieut.-Col. Reid, Mr. Redfield, and Mr. Espy. He then passed over the heads Clouds and Rain, promising, on a future day, to bring forward some facts connected with extraordinary falls of rain which had been observed; but which, as stated by him, in one instance in his former report, had been called in question during his absence. On the subject of Electricity, he observed, that little had been added either to our instrumental resources, or to our knowledge of the subject, since his former report. On the subject of Meteors, the report contained all that had been added to our knowledge on the subject of the unusually numerous appearance of those which had been seen on the 12th and 13th of November, and 10th August, for some years; and concluded by pointing out the advantages of public meteorological observatories, for the purpose of 1st, determining laws; 2nd, keeping, and under proper regulations suffering to be inspected, standard instuments; 3rd, making and recording observations, in number and with a regularity not to be expected, and scarcely ever obtained, in observatories maintained by individuals. Private stationary observations were next noticed, and suggestions thrown out; and lastly, travelling observations.

A report was then read, 'On the application of a portion of the sum of 50*l.*, voted by the British Association at its meeting at Birmingham, in 1839, for Discussion of Tide Observations, and placed at the disposal of the Rev. W. Whewell.'

A portion of this sum has been expended upon calculations, having for their object to determine the effect of the moon's declination upon the tides. The determination of this correction is attended with peculiar difficulties, and has hitherto been incompletely effected. These difficulties arise from this: that the moon's mean declination is different in different years, through a cycle of eighteen years, the period of revolution of her nodes. The inclination of her orbit to the equator varies from about 18° 20′, its amount in 1829 and 1830, to 28° 40′, its amount in 1837 and 1838. Hence, if we attempt to determine the declination correction (of height, for instance) by taking the difference of the height from the mean height (allowance being made for other corrections), we refer to a variable standard. Accordingly, if we find from the observations the mean semimenstrual inequality for the successive years, it will be different in consequence of the different mean declinations in successive years; and it is only by taking a series of nine or more years that we can obtain the absolute mean semimenstrual inequality, and consequently the absolute correction for declination applicable to all years alike. This being known to be the case, I was disposed to take advantage of an opportunity which occurred of discussing a series of several years' tide observations, with a view to the verifying in fact these theoretical features of the correction tables, and determining the correction for declination. Mr. Dall, the Harbour Master at Leith, had made a series of tide observations, extending from 1827 to 1839, which I had every reason to believe to be accurate; and Mr. Ross, of the Hydrographer's office, had, for his own satisfaction, begun to arrange these observations, with a view to discussions relative to lunar declination and parallax. The latter gentleman undertook, at my request, to conduct his discussion in such a manner that it might bring into view such results as I have above described. The arrangement and discussion of thirteen years' observations of tides (involving the management of above 18,000 numbers given by observation, and double the number extracted from tables), was, of course, a business of very great labour and time; but as this task was not originally suggested by the British Association, nor directed exclusively to objects pointed out by it, I thought it my duty to confine my expenditure within a sum very disproportionate to the magnitude of the labour. Mr. Rose has been paid 20*l.* for his discussion of the above-mentioned heights, with a view to the declination correction. The result of this discussion is very nearly what I had anticipated. The semimenstrual lines taken for different years, differ by the effect of the different mean declination. Thus the correct mean of the height of high water for each hour of transit, is about six inches less in 1837 than in 1829, and this difference is balanced by a difference in the declination correction which is to be applied to this mean. The declination correction is greater in 1837 than in 1829 for equal declinations. The difference, however, is not constant, but increases with the declination, which agrees with what the theory indicates. The curves which express this correction, deviate considerably from each other at the higher declinations. This result suggests an improved method of applying the declination correction to tide observations, which, however, requires to be further considered and examined before it can be confidently recommended: I mean, a method of using a different semimenstrual inequality and different declination correction for every different period of the moon's nodes. On this subject it may hereafter be possible to speak more decidedly. W. Whewell.

Another portion of the sum placed at my disposal has been expended upon calculations and operations performed by Mr. Bunt. These calculations were in the first place directed to the determination of the form of the curve of rise and fall of the tides at Bristol. This determination was the more desirable, inasmuch as calculations were in progress at the Admiralty (under my directions) for the purpose of determining the form of the curve of rise and fall at Liverpool and at Plymouth. The results of these calculations have been laid before the Royal Society, and are now printed by them in the Philosophical Transactions, as the twelfth series of my Researches on the Tides. The accompanying communication from Mr. Bunt contains the result of his investigations on this subject. The thing principally discussed was the displacement of the summit of the curve of rise and fall; that is, the difference of the time of high water actually observed, and the time obtained by bisecting the interval between equal altitudes, before and after high water. The main object was, to refer this displacement to its proper argument. It was natural to suppose that it depended mainly upon the height of the tidal wave, and, consequently, upon the age of the moon; and hence would principally consist of a semimenstrual inequality. But by the discussions, it appears that there is, besides this fact, one which depends upon the solar parallax, and also others. This would lead, as Mr. Bunt remarks, to a suspicion that meteorological causes are concerned in producing the result; the subject however is as yet not free from difficulty. I have also employed Mr. Bunt in other discussions, with a view to further improvements in our knowledge of the laws of the tides, especially with reference to two

points:—the determination of the best anterior epoch, or period, at which that anterior transit of the moon is to be assumed which governs the tide:—and the solar corrections for parallax and declination. The excellence of the Bristol observations made with Mr. Bunt's machine, and of his modes of discussing the observations, induce me to believe that some progress may still be made in this inquiry; but the investigation is not yet completed. I have also taken the liberty of directing Mr. Bunt to perform an operation not precisely included in the terms of the grant made to me for the present year, but closely connected with it, and forming an almost necessary sequel to a large operation performed at the expense of the Association in preceding years; I mean, a repetition of the levelling of a portion of the level line in the neighbourhood of the recent landslip in Devonshire. The southern extremity of the line levelled from the Bristol Channel to the English Channel is at Axmouth. When the great landslip took place in that neighbourhood, it might naturally be suspected that a part of the level line might be disturbed. A moment's reflection made this appear improbable, since the movement seemed to be confined to the chalk and the clay below it; whereas the terminus of the level line was bedded in the red marl. Still, if the movement of the ground were the result of an earthquake, even the inferior strata might have been slightly stirred; and this appeared to be exactly one of the cases, the decision of which was contemplated in the project of the level line. I therefore requested Mr. Bunt to repeat the levelling of the line from the mark in the church tower, in the village of Axmouth, down to the shore, where is the granite block which forms the terminus of the line, a distance of $\frac{4}{5}$ths of a mile. In July of the present year this operation was performed (with the same instruments as before), and it appeared that the mark in the church tower was above the mark in the block .... 5.8836 feet, which in July 1838 had been found to be, 5.8805 feet. The difference, $\frac{1}{4}$th of an inch, may be considered as a proof that there has been no sensible change. Mr. Bunt also levelled from the granite block, about 230 yards, to another bench mark eastwards, or towards the landslip, but found no difference of any importance. The expense of this operation, 10*l.*, I have taken the liberty of including in the account for tide discussions. W. Whewell.

I should wish, Mr. Whewell added, to have a grant of 50*l.* made to me for further tide discussions.

Mr. Bell, of Edinburgh, begged to inquire from Prof. Whewell whether the effect of the varying pressure of the atmosphere upon the tides had been ever observed: for it is manifest that if there were a difference of one inch of barometric pressure upon two distant parts of the ocean, say 1,000 miles apart, the difference of water level to compensate this should be over thirteen inches.—Mr. Whewell replied, that Mr. Lubbock, in his tide observations at Liverpool, had observed, and M. Daussy had long since noticed it.

The President inquired whether Mr. Graham was present, and ready to read a paper on his method of approximating to the value of the roots of numerical equations. Mr. Graham not being present, the President requested Prof. J. Thomson to give a slight sketch of Mr. Graham's method.

Prof. Thomson said, that he had examined the paper of Mr. Graham, and considered it to be correct in principle, but did not conceive that the method was so convenient as the method of solving numerical equations published many years since by the late Mr. Horner. Mr. Graham's method consisted of transposing all the terms but one to the same side of the equations, dividing by the co-efficient of the power of the unknown quantity involved in that, and extracting that root of both sides, which the index of the unknown quantity denoted; then substituting for x a first limit, a second was obtained, and so on *ad libitum*. Prof. Thomson exhibited the same question worked by the method of Mr. Horner and by Mr. Graham.—Mr. Smith said that it appeared to him the method was essentially defective, in that it only gave one of the roots of the equation. Mr. Smith then stated one or two curious properties of the roots of symmetrical functions, and showed that there are some cases extended to functions which were not symmetrical.

Section B.—CHEMISTRY AND MINERALOGY.

President—Dr. T. Thomson.
Vice-Presidents—Prof. T. Graham. Prof. Johnston.
Secretaries—Dr. R. D. Thomson, Dr. T. Clark, Dr. L. Playfair.
Committee—Prof. Bunsen (Marburg), Mr. W. Crum, Dr. Ettling (Giessen), Dr. Redtenbacher, Messrs. R. Mallet, R. M'Gregor, F. Penny, Dr. G. O. Rees, Prof. Schaubarth (Berlin), Messrs. E. Solly, J. Tennant, Dr. Varrentrapp (Frankfort).

Prof. Schönbein, on some Electrical Phenomena.—It is well known to electricians that in certain electro-chemical decompositions a peculiar odour is evolved, very analogous to that produced by common electric sparks, or by the working of an ordinary electrical machine, in the air. M. Schönbein has undertaken a series of experiments, in order to ascertain the circumstances under which this electro-chemical odour is evolved, the causes which influence its production, and, if possible, the principle to which its appearance is to be attributed. This peculiar odour is evolved at the anode or positive surface, when certain aqueous solutions are decomposed by the passage of a voltaic current. The oxygen gas which is then evolved has a strong and peculiar smell, which is perfectly similar to that which is always perceived when an electrical machine is worked, or sparks passed through the air. M. Schönbein has observed that the odour is evolved on the decomposition of water, dilute sulphuric acid, solutions of phosphoric and nitric acid, potassa, and many oxysalts; dilute sulphuric acid yielding it in the greatest quantity; whilst no smell whatever was perceived on the decomposition of solutions of hydracids, chlorides, bromides, or iodides, which not only did not evolve it themselves, but by their presence, even in small quantity, prevented its evolution from solutions which would otherwise have produced it abundantly. He found, on collecting the oxygen gas evolved at the anode, from a solution capable of evolving the odour, that the odour might be preserved for some time by enclosing the gas in well-stopped bottles. From the characters possessed by this oxygen, M. Schönbein was led to consider the odour due to the presence of a minute quantity of a new and hitherto wholly unknown substance, of considerable importance in many natural phenomena, and he has therefore named it from its most evident character Ozone. Its properties are briefly as follows: it is only evolved from solutions containing it, by perfectly clean electrodes of platinum or gold; whilst charcoal and the more oxidizable metals are unable to cause its appearance. It can only be obtained from a cold solution, as heat prevents its evolution. When a piece of one of the oxidizable metals, such as zinc, tin, iron, mercury, &c., or a few drops of solution of the protochloride of tin, or protosulphate of iron, are placed in a portion of oxygen impregnated with ozone, that peculiar substance is almost instantaneously absorbed; and the oxygen becomes inodorous. When perfectly clean and dry plates of gold or platinum are immersed in oxygen containing ozone, they acquire a negatively electric state of polarity; silver and copper also become thus electric, but in a far less degree than gold or platinum. The plates thus polarized retain their electric powers in air for a considerable time, but rapidly lose it, when plunged into hydrogen gas, in which, if retained a sufficient time, they acquire an opposite state, becoming positively polarized. M. Schönbein then compares these effects with those produced by the odorous matter peculiar to common electric sparks and brushes. When a perfectly clean and dry plate of gold or platinum is exposed to an electric brush issuing from a charged and conducting point, it becomes positively polarized, and the degree of polarity depends on the nature of the point and the time which the plate has been exposed to the influence of the brush issuing from it. He shows that the power is not due to the mere current of electricity escaping from the point, but to some substance produced or evolved by it; because if the point be moistened, the electricity still continues to be given off as a brush, but the power of polarizing the gold or platinum plates is lost. A plate thus charged is perfectly similar in its electrical powers to a plate charged or polarized by immersion in oxygen impregnated with ozone. Heat or exposure to hydrogen, which destroys or inverts the electricity of such a plate, exerts a precisely similar action on plates polarized by exposure to the brush; and likewise, if the plates are not perfectly clean and dry, it is equally impossible to charge them, either by exposure to the brush or by immersion in oxygen containing ozone. M. Schönbein supposes that there exists, both in the air and water, a very minute quantity of an electrolyte or compound substance, which, when decomposed by electricity, evolves, as one of its constituents, the peculiar odorous matter called ozone. He observes that both from its electromotive power, and likewise from its strong affinity for metals, it is evidently similar to chlorine, bromine and iodine. Its non-appearance, when water is decomposed by electrodes of the more oxidizable metals he attributes to its entering immediately into combination with those metals; and he considers that when the solution is heated, the affinity of the ozone for metals is so much increased that it is even able to combine with gold and platinum, thus accounting for its disappearance when heated. By this theory, all the phenomena attendant on its evolution may be easily explained, and it hence becomes very interesting to search for traces of this widely diffused substance. M. Schönbein considers that the smell perceived whenever bodies are struck by lightning, is probably due to a small portion of ozone being set free, and relates a case of a church lately struck by lightning, which fell within his own observation, in which the surrounding buildings, to a considerable distance, were filled with a bluish vapour having a peculiar pungent odour. Even in this early stage of the inquiry it will readily be seen that many curious and unexplained phenomena might be accounted for, if the existence of the supposed electrolyte be proved. M. Schönbein proposes devoting all his leisure to the prosecution of this inquiry, in the details of which he is at present engaged.

Mr. E. Solly on Bleaching Vegetable Wax.—The author found that the best effect was produced by chlorine, but in this case it was necessary that the materials used to evolve the gas should be intimately mixed with wax, and then, of course, the difficulty of separating the residue occurred; and when a stream of chlorine was slowly passed through the wax, the process was very tedious; he subsequently found that strong nitric acid was a powerful decolorating agent, and it possessed the advantage of leaving no residue which was at all difficult of separation; but the expense of this process was a great objection to its use. The following method was ultimately employed: The wax was melted; a small quantity of sulphuric acid was poured in, composed of one part of oil of vitriol to two of water, and then a few crystals of nitrate of soda stirred in; the whole was then agitated with a wooden stirrer and kept heated. Nitric acid was thus evolved in considerable quantity and purity from a large surface, and in such a manner that all the acid evolved must necessarily pass through the melted wax. This method answered the purpose very completely, the process was cheap and rapid, and the residuum, being merely a little solution of sulphate of soda, was easily removed. When it is desired to employ chlorine in place of nitric acid as the bleaching agent, the same process may be adopted.

Prof. Gregory read a communication 'On the pre-existence of Urea in Uric Acid.'—By the action of peroxide of lead on uric acid, Liebig and Wöhler obtained from it oxalic acid, allantoine, and urea, and they considered the latter as existing in the uric acid, combined with urile. The author, having found that urea, unlike most organic substances, resists the oxidizing agency of permanganate of potash, thought that if urea could be obtained from uric acid by the action of that salt, the argument for its pre-existence would be much strengthened; as, if only the elements of urea were present, the oxidizing agency of the permanganate would most likely prevent its formation. On trying the experiment, a large quantity of urea was obtained, along with oxalic acid, and a new acid, probably formed by the oxidation of allantoine. The author further described the acetate of urea, a salt which was formed in his experiments.

Prof. Gregory then exhibited a new process, communicated by Prof. Liebig, for preparing the very singular and beautiful compound termed murexide by Liebig and Wöhler, and purpurate of ammonia by Prout. The process is quite certain, and very productive. It consists in adding a boiling solution of 7 grains of aloxan and 4 grains of aloxantine in 240 grains of water, to 80 grains of a cold and strong

solution of carbonate of ammonia. The mixture instantly acquires a deep purple colour, and, on cooling, deposits the golden green crystals of muriate.

'On the relation of Form to Chemical Composition,' by Dr. Schafhaeutl.

The author stated, that he had, in a former communication, given a new method of procuring graphite, in which it was also shown that all graphites owed their origin to the operation of the same causes; namely, the contact of bitumen (or any similar substance) with a silicate, under a certain limited degree of heat; it was further maintained, that the compound nature of graphite might be satisfactorily demonstrated, by subjecting it to the action of hydrofluoric acid, which, combining with the silicon, liberated the carbon of the graphite as a hydruret, which was then consumed in the flame of a lamp. The object of the present paper was, to explain the circumstances under which certain modifications of form take place in this peculiar substance, (as also in others generally considered to be elementary,) and to prove their connexion with changes of an entirely chemical nature. A beautiful specimen of a formation of graphite was exhibited to the Section, obtained from the Neath Abbey Ironworks, in South Wales; it appeared to be composed of an infinite number of foliated scales overlapping each other, after the manner of the slates of a roof, each scale being so thin, as to be agitated by the lightest breath of air: a second specimen was exhibited of a graphite leaf, where it appeared as a globule of much greater size, the laminated structure still, however, existing in beautiful developement. In a third stage, the scaly structure disappeared; the globule having assumed a more porous and coke-like form. Dr. S. having premised an objection to any explanation of these curious changes of form, founded merely upon molecular alterations, proceeded to detail certain experiments, from which he deduced conclusions of an interesting and important nature. The discovery of a new mode of decomposing crystallized graphite, by heating it in concentrated boiling sulphuric acid, and adding a little concentrated nitric acid (see a description in the *Phil. Mag.* xvi., xvii.), afforded a series of singular and instructive phenomena. After the evolution of binoxide of nitrogen had ceased, each scale of graphite was converted into the globular substance before described; its external metallic lustre remaining unchanged, but its bulk so greatly enlarged, that what before appeared a single scale, became, by the separation and division of its component laminæ, a thick spongy tissue, capable of being restored to its former compressed foliated form, by the pressure of the finger nail. That this change of form, however, was not merely a mechanical effect, appears from the following experiment:—Graphite scales having been repeatedly treated with hydrochloric acid, washed, and again digested in a strong solution of caustic potash, in order to remove all possible mechanical admixtures of iron, silica and alumina, were then subjected to the process above described; the evolution of binoxide of nitrogen having ceased, an equal quantity of water was added to the mixture; immediately there succeeded a rapid evolution of bubbles from the globules of graphite, which at first lay at the bottom of the fluid; becoming lighter, as this evolution of bubbles proceeded, they gradually rose to the surface, when the gas immediately ceased to be evolved; the acid then, or the graphite, must have been combined with hyponitrous acid, which being decomposed by the water, was disengaged as binoxide of nitrogen. The globules when washed, dried, and weighed (at first weighing but 2.01 grs.), *had gained* 5.02 grs. in weight. Being then put into a flat covered dish of brass, and balanced accurately, the cover was removed, the globules immediately lost weight, and so rapidly, that in merely removing them from the dish, 0.18 grs. were lost; the dish was covered with a dew, apparently acid, as it acted on the brass. These globules, heated on paper until it became slightly tinged with yellow by the heat, now disengaged dense fumes, the paper being streaked with a blackish coloured smoke where it was in contact with the graphite; 2.30 grs. were lost during this process, which being repeated a second time, they were found to have lost 2.25 more. Finally ignited in a platinum crucible, dense fumes, without any perceptible odour, escaped, the weight of the globules being reduced to 1.86 grs. After which, no further reduction took place during ignition for half an hour in the open air. The total loss of the 2 grains thus experimented upon with the acid, was 6.96. In a paper by the author, (see *Philosophical Magazine*, cited above,) this loss was attributed to evolution of carbonic acid gas during this conjoined action of the acids; but it would appear from the last experiment, that there is formed a compound of sulphuric acid, nitric acid, carbon, hydrogen and oxygen, volatilized only at high temperatures. The question here arises, how can the rapid loss of weight be accounted for? During the previous drying process, which was conducted at 212°, the loss of water must have been accompanied by a change of chemical composition, and the new compound, by attracting water or oxygen when in the pan, must have formed an extremely volatile combination, evaporating as rapidly as it was formed. By a repetition of this treatment with the acid, graphite in the third stage, as before described, was obtained; the metallic lustre was entirely lost, as also the laminated texture; it now appearing as a porous mass, resembling coke, and no longer capable of reduction to its original foliated state by pressure, having undergone a decided chemical change. The acid solution deposited at once a copious precipitate of silica and alumina, (slightly tinged by oxide of iron,) upon the addition of ammonia to neutralization. A similar precipitate was obtained from the acid of the first experiments, but less in quantity, and requiring a longer time for its operation. Thus it would appear that the abstraction of silicon and the change of physical properties of graphite, are corresponding and mutually connected phenomena. In further proof of the necessary connexion of silicon as a chemical combination, essential to the existence of the scaly metallic lustre of graphite, it will be found that by repetition of the same experiments, the globules ultimately disappear, and the remaining solution in acid neutralized by ammonia, deposits only flaky silica, with traces of oxide of iron. On observing attentively the specimen of graphite, as found in its natural state, and comparing it with those treated with acids and alkalies, also exhibited, it appeared that the scales, before being operated on, had a dirty greyish appearance, described as owing to their being covered with spots, consisting of microscopic six-sided flattened prisms of silicate of iron; the matrix of this graphite formation, in the blast-furnace cinder, essentially composed of bisilicate of lime and alumina, deriving a yellowish tint from a slight admixture of sulphuret of calcium, with a trace of sulphuret of potassium. Scales of very different density may be separated, the thinnest unaffected by the magnet, the thicker ones decidedly so; those in the middle of the mass, thicker and stiffer, not easily broken, and showing a shining black fracture, like that of anthracite, form a variety of graphite, in which silicon and iron are greatly predominant, developing when treated with hydrochloric acid, a fetid hydrogen characteristic of cast iron, and separating at the same time yellow flocks of silica and alumina. Dr. Schafhaeutl then proceeded to point out an analogy between the formation of grey iron in the blast furnace, and that of graphite; namely, that the same chemical conditions occur during the change of white iron into grey; this takes place after having descended through the furnace, and reached the stratum of slag covering the melted metal; this slag being an earthy bisilicate (in coke furnaces, approaching to a trisilicate), and containing a small quantity of protoxide of iron. As silicon is found in graphite only in very small quantity, it has been considered an accidental impurity, just as the small quantity of hydrogen retained by charcoal, sulphur, &c. has been considered an impurity; but as these foreign matters can by no chemical means be separated, without destroying the state in which graphite, charcoal, and sulphur exist, it must be inferred that such admixture is essential to their existence in that state in which they ordinarily appear. Quitting now the individual consideration of graphite, the author extended the principle here argued to certain other substances, considered generally as simple bodies. For example, sulphur obtained by the decomposition of sulphurets by acids, is white in colour, and invariably combined with a stable quantity of hydrogen. But obtained from hyposulphites, it is as invariably yellow, and the presence of free hydrogen in the slightest quantity, bleaches the precipitate. The known case of sulphur precipitated under the presence of sulphuretted hydrogen, and cautiously mixed with metallic copper in its utmost state of minute division, being found to combine directly, evolving a dull red heat, has been considered an exception to the law, that no two dry bodies unite without the intervention of a third; but sulphur precipitated from hyposulphites, will not thus combine, nor will pure sulphur, though subjected to the minutest division possible. The same sulphur, however, brought into contact with hydrogen, under a pressure of four atmospheres, and then quickly mixed, is found to combine, as in the first instance, but if exposed to the air, its power of combination is again lost; thus, a third body is proved necessary here as in all cases. And further, the author doubted if one of the two different crystalline forms of sulphur is not owing to the presence of hydrogen, which he found to be in combination with it in a very perceptible quantity. These peculiar forms of combination where a few atoms of one body are combined with a high number of atoms of another, may be considered, perhaps, as forming a class of compounds intermediate between the inorganic and the higher organic compounds: thus, the compounds of arsenic acid form a very striking example. In the subarseniate of iron, 50 atoms of iron are combined with only 3 atoms of arsenic acid and 75 of hydrogen. So again, 24 atoms of arsenic with 1 atom of sulphuret of potash in sulph-arseniate of potash. By gradually passing from compounds of inorganic chemistry to those of organic chemistry, we find disacetate of copper with water, 48 atoms of oxide of copper combined with only 1 atom of hydrogen and 12 atoms of water. And finally in the field of organic chemistry itself, we have, for example, margaric acid, composed of 67 atoms of hydrogen, 35 carbon, and 3 of oxygen only. In the oleic acid, 120 atoms of hydrogen are combined with 70 of carbon and 5 of oxygen; in the stearic acid, 134 atoms of hydrogen with 70 of carbon and 5 of oxygen, &c. The author hinted in his paper in the *Philosophical Magazine*, that the principal circumstance which tended to produce compounds of such multiplicity of atoms, or, in fact, organic compounds, was the separation of the molecules of bodies brought into action by the capillary powers of the vessels of organic structures. It was probable that the chemical action of these separated molecules must be a different one from their action, when arranged into one definite form; and as proof that once received laws of affinity were exhibited only under peculiar circumstances, he directed the attention of the Section to H. Rose's compound, formed by direct combination of 29.97 per cent. of ammonia with 70.03 per cent. of sulphuric acid, which ought to have produced anhydrous sulphate of oxide; but after combination, neither sulphuric acid nor ammonium could be detected in the compound. The same chemist found combinations of anhydrous sulphuric acid with the chlorides of ammonium, potassium, sodium, and the nitrate of potash. According to the laws of affinity, for example, in the last case, the nitric acid ought to have been displaced, decomposed, and driven away by the more powerfully acting sulphuric acid; but no tendency whatever was shown to the displacement of chlorine or nitric acid, and new compounds, different from all hitherto known, resulted. As no combination of anhydrous sulphuric acid took place at all with oxide of calcium, chloride of barium, or chloride of copper, he concluded, that these above-mentioned combinations were formed only by replacing one double atom of hydrogen, water, or chlorine, in order to form a bisulphate of potash, soda, or ammonia. The author seemed to believe, that there existed two different states of chemical combination, the first in which the chemical forces of molecular attraction were acting only according to the relative quantities of matter; the second, where, under the always catalytic presence of a third, the elementary substances arranged themselves, separating in groups according to the resultant electric forces of the centres of action created by the above-mentioned presence of a third, acting differently on the different molecules of bodies in contact, in a somewhat similar way as a solution, which does not crystallize unless the molecular equilibrium of the liquid is disturbed. The first state of chemical combination might, perhaps, have some distant relation

to Dumas's law of types; the second state, a mere consequence of the first, would be represented by Berzelius's electro-chemical combination. The author, at the same time, referred to Prof. Graham's admirable papers, in which the Professor had so distinctly pointed out the great and *peculiar* part which matter performs in chemical solid combinations, and remarked, that during all chemical combinations where a third body is separated, the precipitation only would take place when a certain quantity of water combined with the body to be precipitated, which water separated in the relation to the separation and consolidation of the precipitate only, and could be driven away from it only by applying a red heat.

'New compound of Arsenious and Sulphuric Acids,' by Dr. Schafhaeutl.

This was obtained from the escaping smoke of copper calcining furnaces near Swansea, in South Wales. The new compound was another singular instance where an anhydrous crystallized body was deposited under the presence of water only, and was a remarkable proof of the unlimited number of different forms of combination, which might be produced even in inorganic nature, by bringing chemical substances in contact under varying circumstances. The copper ores smelted in South Wales were, for the greatest part, copper pyrites, mixed with iron pyrites, grey copper ore, &c.; in fact, a mixture in which the sulphurets of copper, iron, arsenic, antimony, cobalt, nickel, zinc, and tin, were invariably found together. The sulphur and arsenic escape from these ores during the calcining process, as sulphurous and arsenious acids, and have been found to destroy all vegetation for miles around the copper works, without affecting animal life in the slightest degree. By bringing the escaping fumes in contact with steam, and forcing it through burning charcoal, or subjecting it only to a great pressure in contact with steam, the new solid compound was deposited on the cool surfaces of the chambers connected with the calcining furnace. It was deposited in beautiful crystallized leaves or tables, perhaps belonging to the same class as Wöhler's dimorphic modification of the crystallization of arsenious acid, the regular form of which belongs to the octahedron. It was found to consist, in 100 parts,

of 69.250	Arsenious acid.
27.643	Sulphuric acid.
3.029	Protoxide of Iron.
0.420	Oxide of Copper.
0.656	Oxide of Nickel.
99.998	
Corresponding to 51.741	Metallic Arsenic.
11.095	Sulphur.
2.339	Iron.
0.336	Copper.
0.516	Nickel.
33.971	Oxygen.
99.998	

These crystals attracted moisture from the air with great rapidity and with evolution of heat, corroding animal and vegetable substances as powerfully as concentrated sulphuric acid. Their taste was pure, but powerfully sour, similar to sulphuric acid, and, dissolved in water, the remainder of 100 parts of these crystals was 17.436 grains only. The shape of the crystals was perfectly retained, only their appearance was changed from transparent into opaque. Their chemical composition was found to be,

16.778	grains of Arsenious acid.
0.656	Oxide of Nickel.
17.434	

What the water had dissolved consisted of

51.472	Arsenious acid.
27.643	Sulphuric acid.
3.029	Protoxide of Iron.
0.420	Oxide of Copper.
82.564	grains.

One of the remarkable changes during the formation of this compound, was the conversion of sulphurous acid into sulphuric acid, as well as the presence of iron, copper, and nickel in a deposit from gaseous matter. No other definite compound of arsenic acid with another acid seems to be known, except those with the organic tartaric and paratartaric acids.

SECTION C.—GEOLOGY AND PHYSICAL GEOGRAPHY.

Presidents—Mr. C. LYELL; Mr. B. G. GREENOUGH (*for Geography*).
Vice-Presidents—Rev. Prof. BUCKLAND, Mr. H. T. DE LA BECHE: Mr. J. SMITH; Capt. WASHINGTON (*for Geography*).
Secretaries—Mr. W. J. HAMILTON, Mr. H. E. STRICKLAND, Mr. D. MILNE, J. SCOULAR, M.D.; Mr. H. MURRAY (*for Geography*).
Committee—Prof. Agassiz, Sir J. E. Alexander, Messrs. R. Bald, J. E. Bowman, J. Bryce, Prof. Couper, Mr. T. Edington, Marquis of Enniskillen, Sir P. Egerton, Bart., Mr. R. Griffith, Lord Greenock, Mr. B. Ibbetson, Prof. Johnston, Messrs. W. Murray, R. I. Murchison, J. M'Adam, A. M'George, jun., Prof. Nichol, Marquis of Northampton, Mr. J. Phillips, Major Portlock, Prof. Ramsay, Dr. Rankine, Prof. Robb, Messrs. W. Sanders, G. W. Wood, M.P., J. Yates.

C. Lyell, Esq. F.R.S. in the chair.

The first communication brought before the meeting was from Dr. Robb, 'On the geology of the country round the river St. John, in New Brunswick.'—Dr. ROBB stated, that the St. John is as large as any of the first class European rivers. It drains a large portion of the province of New Brunswick; and the volume of water which it discharges into the Bay of Fundy is very great, especially during the spring floods. Yet in one place the river is so contracted that it is not more than 310 feet in width. In the Bay of Fundy, as is well known, the tides rise higher than in almost any other part of the globe, there being sometimes, in spring tides, a rise of from 40 to 60 feet. The tidal wave is then forced up into the narrow parts of the river, and causes a backward fall of water, against the natural current of the water, of many feet in height. In the spring, the river is much swollen from the melting of the snow, and between its level in spring and in summer there is a difference of fourteen feet. Dr. Robb then alluded to the singular configuration of the country in the vicinity of the river, it being shaped in terraces, one below the other. The river, from the distance between the first or uppermost pair of terraces, appears to have been of much greater width, and subsequently to have gradually become contracted, until confined within its present narrow limits. The higher terraces slope towards the stream, the lower ones become more horizontal, and the lowest is with a slope turned from the river, an appearance which Dr. Robb explained by the successive depositions of alluvial matter near the bed of the stream, and extending no farther, so that depressions resulted behind these depositions, which often contain water. In no part of the world can the phenomena of rivers be studied better than in America, from the little alteration produced upon them by the hand of man. In many parts of the new continent the rivers present these terraces; they may be observed near the St. Lawrence, the Mississippi, and in many other places; and had the rivers of the Old World been examined before their banks became cultivated, in all probability they would, in many cases, have displayed similar terraces. Dr. Robb then adverted to the theory which explains the formation of these terraces by the bursting of the barriers of lakes through which the river had passed. He conceived that in a few cases the phenomena might be so explained, but that in general we must have recourse to an up-heaving of the land for the solution of the problem, and this up-heaving, he conceived, must have taken place at a comparatively recent period. In these terraces but few organic remains had been discovered, which he accounted for by the paucity of limestone rocks from which mollusca could obtain matter for the formation of shells; the long cold winter, too, might have its influences. He had, however, found in the lower terraces *Uniones* and *Anodontes* resembling those now existing in the river. Some bones had been discovered, but they seemed to be recent, probably belonging to the spermaceti whale. In the different terraces there was a difference in the quality of the soil, there being most alluvion on the lowest terraces. The middle terraces, being so nearly horizontal, were well fitted for roads, and advantage had been taken of them for that purpose. At Frederickton, where wells had been sunk, the vegetable soil was three inches deep, after which fourteen feet of sand was gone through, when water was obtained, retained by a bed of clay, underlaid by a slate rock. The terraces were composed wholly of detrital matter, the upper ones being coarser, and often having boulder stones, some of which were fifteen feet in diameter, and seemingly derived from parent rocks to the north-west, as they appeared to have travelled in a south-easterly course, indicated by scratches on the ground, coinciding with the major axes of the boulders. The rocks in the neighbourhood of the river are slates, with some limestone, the whole disturbed by syenite. In the Bay of Fundy, and also in the Gulf of St. Lawrence, are raised beaches, containing marine shells, which raised beaches he would place in the same category as the terraces of the river St. John.

Mr. LYELL alluded to a paper on Glen Roy, written by Mr. Darwin, in which he had had recourse to the theory of elevation, to explain the phenomena of the parallel roads. He had observed, in the district of Lochaber, terraces sloping towards a river, similar to those described by Dr. Robb, but the reflected lower terrace was peculiar to America, where, in inundations, the high alluvial banks next the bed of the river were the only land visible. He did not see any exact resemblance between the roads of Glen Roy and the terraces of the river St. John. It was remarkable, however, that in the latter there were both terraces of deposition, (viz. the lower,) and terraces of denudation (the upper).—Mr. GREENOUGH was averse to the theory of elevation; he preferred that of a subsidence as causing the phenomena described, although the two theories might be reconciled. All rivers show indications of a greater rush of water than at present.—The Marquis of NORTHAMPTON inquired respecting the nature of the vegetable soil on the surface of the terraces.—Dr. ROBB explained, that the deposit differed both as to quantity and quality on the different terraces.—Dr. BUCKLAND inquired whether there was any gravel or other detritus on the terraces?—Dr. Robb said the soil or sedimentary matter composing the lower terrace was of the finest quality, the materials being smaller than the others, where it was coarse. The farmers of the country were aware of this fact, and set three times the value upon the lowest which they did upon the higher terraces. In all cases in the lowest terrace there were found portions of the rocks occurring farther up the river.

Mr. SMITH, of Jordan Hill, next read some extracts from a paper by Mr. Stevenson, 'On the Relative Level of Land and Sea, and on the alteration of the East Coast of England.' Mr. Stevenson had observed, in many places, but little variation in the mean level of high and low water, and he proposes this level as a standard or constant quantity. Certain stations in different parts of the kingdom are to be taken, and the point of medium level accurately ascertained in each of these, by the use of the spirit level and the tide gauge, throughout at least one lunation, embracing both the extremes, and the mean of the tidal range; these points to be marked by lines eighteen inches in length. The station to be taken at light-houses, in the north, south, west, and east of Great Britain and Ireland.

Mr. SMITH then made some observations 'on the superficial beds in the neighbourhood of Glasgow,' the uppermost of which is a sand; the next a brick clay, interlaminated with sand, containing marine shells, and then a bed, called in Scotland till, and containing boulder stones. These are evidently post-tertiary. Between these and the sandstone are three other beds. Mr. Smith has discovered, in elevations often forty feet above the present shores, beds of shells, containing about eighty-five per cent. of species now existing. Those of extinct species resemble shells from Canada, and indicate a colder climate at the time the animals existed. In the till, shells are of very rare occurrence, although it sometimes contains large bones. The bed of brick clay seems to have been frequently subjected both to elevation and subsidence; the latter condition being more difficult to observe, from its being often beyond our view. The brick clay of the neighbourhood of Glasgow appears also to coincide in age with the Carse clay of the east of Scotland, as may be seen in the valley of the Tay, where a singular phenomenon is presented by a bed containing stumps of trees, which is covered by another containing littoral shells. He mentioned that Dr. Thomson, of Glasgow, had recorded a whin dyke that penetrated the superficial sand of this city, but he was not aware of the sand having been altered by it; also, that in Cumbrae a great wearing away of the sandstone was proved by the dykes, as they were now presented to the observer: allowing a foot in the century for this destruction, it would require many centuries to effect what has been done, which induced Mr. S. to consider the post-tertiary period to be much longer than is generally supposed.

Mr. De la Beche mentioned the occurrence of shells in cliffs, at a maximum height of forty feet in different parts of the west coast of Great Britain, a height coinciding with Mr. Smith's observations, and showing a general action.—Dr. Buckland mentioned some curious phenomena in the Mendip Hills, where the carboniferous limestone is found perforated by pholades, although far inland. He also stated his opinion, that the destruction of the sandstone at the Cumbrae might be more rapid than Mr. Smith imagined, from the immense destroying power exerted by storms. Recent observations had brought to light many curious phenomena of elevation and subsidence. At Swansea had been discovered submerged peat with footsteps of deer, and under this peat was a stratum with footmarks of deer also.—Mr. Milne observed, that in a cliff between Stirling and Falkirk shells occur at an elevation of forty feet, which elevation diminishes to thirteen feet lower down the Frith of Forth. On the east coast of Scotland, this bed of shells affords a proof of subsidence, from its being in one place overlaid by sea gravel. Near Stirling may be seen another cliff with a bed of shells, from ninety to one hundred feet in elevation, and which may be traced for three miles.—Mr. Keir announced the discovery of recent shells at Ardrossan, on the shore of the Frith, opposite Arran, thirty feet above the level of the sea.

The Secretary next read a paper by Captain Baddeley, 'On the Geology of Canada.'—The author regretted that little had been as yet done towards a mineral survey of this important colony, as it appears to possess sources of mineral wealth, highly deserving of attention. There is an abundance of iron ore, magnetic, and red and argillaceous oxide; also lead and copper. The part of Canada most metalliferous seems to coincide with a similar region in the state of New York; particularly the country behind Belleville, Kingston, Brockville, and Prescott, near the junction of the primary and secondary formations. Exact information on the subject is wanted, and it would be desirable that an accurate survey should be made of the country. It was mentioned, that some pieces of native gold had been discovered, but scarcely any indications of coal, although in the upper province, from the occurrence of saliferous strata, there was a greater likelihood of its being found: these strata occur near Toronto, and towards Lakes Erie and Huron.

Mr. Greenough spoke to the importance of an accurate geological survey of the United States boundary, as, in former treaties, our government had parted with valuable mineral tracts: he instanced the island of Banca, now so important for its tin mines.—Dr. Buckland mentioned, that large quantities of lime had been sent at a great expense to Gibraltar, the fortifications of which were built on a limestone rock.—Mr. Featherstonhaugh stated, that surveys had been made of Nova Scotia and New Brunswick, by direction of the local governments, and it rested with the Provincial Assembly of Canada to accomplish the same.

Mr. Bowman then read a paper 'On the Silurian Rocks of Llangollen, and on a Plateau of Igneous Rocks on the East flank of the Berwyn Range.' He showed, by the aid of two sections taken on the spot, and rendered more complete by data supplied by Colonel Colby, that the shales and slates composing the hills, for some miles north and south of Llangollen, and west nearly to Corwen, belong to the upper Silurian formation. The rocks have here lost the character of the mudstones of Shropshire and Montgomeryshire, and often resemble the Cambrian series; slates and flags, with perfect cleavage, being quarried at Glyn, Oirnant, &c. They rise from under the Upper Ludlow Rock of Castel Dinas Bran, in which Mr. B. found terebratula, navicula, cypricardia, &c., and they rest on the fossiliferous lower Silurian rocks of Cyrn y Brain. In some of the quarries were found orthocerata, graptolitheus ludensis, and cardiola interrupta. Unlike their soft and uniform equivalents, described by Mr. Murchison, they consist of three groups, passing into each other, and they are not separated from the Upper Ludlow by the usual Aymestry limestone. 1. Blue unfossiliferous shale rising conformably from under the upper Ludlow, and passing into parallel beds of hard siliceous schist, forming the bed of the Dee for several miles above Llangollen, and having their dip in the direction of the stream, and their projecting edges opposed to it. 2. A great thickness of uniform parallel beds of light blue shale, some of which on weathering are whitish, giving the section a banded or streaked character; they form the promontory of Rhysgog, and are largely developed on the west face of the Wridding, near the Holyhead road. Their lower portion is interstratified with bands of hard sonorous graywacke, and they pass into the next group. 3. Slates and flags, quarried at Cefn Uchaf, and on the chain of hills at Oirnant. At the north end of this chain, they repose on the lower Silurian rock of Cyrn y Brain. The total thickness of the three groups is about 3,100 feet. The plateau of igneous rocks occupies an area of about twenty square miles on the east flank of the Berwyn Mountains, between Llanarmon, Dyffryn Ceiriog, and Llansaintfraid Glyn Ceiriog, not noticed in the latest geological maps; it is divided by the river Ceiriog. They vary from a pure white compact feldspar to a grey or greenish trap, which in places is stratified and resembles graywacke. They throw off the sedimentary matter on all sides, bursting through it, and forming insulated trap hills. Near the centre, on the top of Pen y Graig, is a column of compact feldspar, twenty to twenty-five yards deep, and sixteen to eighteen yards wide, hemmed in on each side by lower Silurian rocks, which it has rifted asunder, and overspread laterally to some distance. Some of the stratified traps so repeatedly alternate with the schist, as to seem to be formed simultaneously; others seem to have been injected between the hardened beds. The rifted appearance of the trap in the gorges, shows a second up-heaving, after its first consolidation. Mr. Bowman had also examined the Bala limestone, and collected a number of fossils, which, with one exception, he found to resemble the lower Silurian rock. He is thus uncertain of the boundary between these and the Upper Cambrian. In addition to the absence of the dividing limestones of the upper Silurian, the old red sandstone is wanting in Montgomeryshire and Denbighshire, the carboniferous limestone resting on the upper or lower Silurian; to the north of Cyrn y Brain the limestone itself is wanting, and the millstone grit reposes on the fossiliferous lower Silurian rocks.

Section D.—ZOOLOGY AND BOTANY.

President—Sir W. J. Hooker.
Vice-Presidents—Rev. Prof. Fleming, D.D., Sir Wm. Jardine, Bart., Prof. Graham, Mr. P. J. Selby.
Secretaries—Prof. W. Couper, Messrs. R. Patterson, E. Forbes.
Committee—Prof. Agassiz, Dr. G. W. Arnott, J. H. Balfour, M.D., Mr. J. E. Bowman, Sir J. G. Dalyell, Messrs. G. T. Fox, J. Goodsir, —Gourlie, Dr. Klotzsch, Prof. Link, E. Lankester, M.D., Messrs. W. F. Mackay, W. Macdonald, Dr. P. Neill, J. Scouler, M.D., Messrs. H. Strickland, J. Wilson, N. A. Vigors, M.P.

J. Fleming, D.D., in the chair.

Dr. Fleming, on taking the chair, expressed his regret at the absence of the President, Sir W. J. Hooker, who, on account of domestic affliction, could not attend the meeting.

The first communication was the Report of Prof. Henslow and Committee, 'On the Preservation of Animal and Vegetable Substances.'—The attention of the Committee has been directed to the preserving properties of certain materials when applied separately, either in saturated solutions, or in different degrees of concentration. The experiments have been conducted in glass jars 6 inches by 1½; and saturated solutions of the substances employed having been prepared, were diluted with an equal, and double, quantity of water. 178 preparations of animal and vegetable substances were tried. 1. Results obtained with animal substances. Three salts of potassa—the sub-carbonate, the bicarbonate, and the arseniate, have afforded the most satisfactory results. The solution of the bicarbonate afforded a flocculent precipitate: the solution half saturated appeared the best adapted. The substances preserving next best are, sulphate of zinc, muriate of magnesia, and arsenious acid. After these may be mentioned sulphate of magnesia, sulphate of potassa, and alumina (common alum), muriate of ammonia, sulphate of potash. Corrosive sublimate is a perfect preservative of animal substances; but this salt renders the substances so very hard, that singly it is unsuited to the purposes of natural history; added in small proportions to other solutions, which render objects too soft, it will probably be found of essential service, as well also in preventing the formation of flocculent matter. One part of naphtha to seven of water produces a favourable result, but when used stronger, the specimens are rendered tough. Acetic and oxalic acids decomposed the skin and cellular membrane of fish, but left the muscles untouched. A few drops of kreosote added to water, preserves the objects, but they become stained dark brown. The following substances are entirely unfit for preservatives: carbonate of ammonia, chloride of potash, muriate of barytes, muriate of lime, nitrate of ammonia, nitrate of strontian, the nitrates of barytes, soda, ammonia, and magnesia, phosphate of soda, the sulphates of soda, potash, iron, copper, and rough pyroligneous acid.—2. Results obtained with vegetable substances. The success here is very slight. None of the salts seem favourable, with the exception, perhaps, of the sub-carbonate and bicarbonate of potash. In naphtha and acetic acid, the specimens are preserved, but in the latter they lose their colour, and assume a reddish tinge. Prof. Henslow adds, in a note, that, although carbonate of soda of the shops is not mentioned in the report, he finds it to possess considerable preserving powers on animal substances.

Dr. Balfour observed, that he had seen fruits and other parts of vegetables preserved well in a solution of common salt in water. Arsenite of potassa also preserved the colour of flowers well. As a general rule, he believed that salts containing oxygen would not preserve animal substances.—The Rev. Mr. Brodie thought, that the discoloration of some plants might arise from the presence of tannin, or other principles, that acted on the substances in which they were preserved. He had observed oak and elm to become black in the same solutions in which fir and other wood became whiter than ordinary.—Dr. Fleming observed, it was passing from the dead to the living, but he saw there Sir John Dalyell, who was celebrated for preserving alive the lower forms of animals, and perhaps he would give them some account of his experiments.—Sir John Dalyell stated, that he had in his possession an actinia, which he had kept alive twelve years, another eight years, a holothuria two years, and other animals of the same class, of varying ages. He found it necessary to change their water every four or five days; when kept longer they became weak and incapable of sustaining themselves with their suckers. The actinia will live a long time without food. They feed on small fish, crustacea, and conchifera. The food of the holothuria he was not certain about. A young skait he kept would eat nothing but whiting.—Dr. G. Walker Arnott thought the preservation of plants had not been sufficiently attended to in the report. Spirits, he believed, a tolerably good preservative of plants. Sea-water spoiled delicate plants. The lower forms, as the fungi, &c., were most important, and nothing had been hitherto devised to preserve these in a good state. He had heard of their being kept by immersion in tallow, but had not tried it.

'Further Researches on the British Ciliogrades,' by Edward Forbes and John Goodsir.—Since the last meeting of the British Association, the authors have continued their observations on these animals; no additional species have been discovered, but several interesting facts elucidating their structure have been brought to light. The species examined were the two forms of Cydippe designated *C. pileus* and *C. Flemingii*. They have repeated the observations of Mr. Garner on the ciliation of the walls of the stomach and vessels, and can bear testimony to their accuracy. The cilia towards the base of the stomach are larger than those on the oral portion. A row of very minute cilia surrounds the mouth, but none of these organs are seen on the filamentary tentacula, or on the walls of the filamentary cavities. The cilia which are placed on the longitudinal ridges are linear, lanceolate in form, flat, and not hollow. They are not webbed together, and have no communication with the vessels which run beneath the ciliary ridges. Each row of cilia is mounted on a transverse base of a more solid texture, and less transparent than the rest of the body. The substance of this base consists of globules irregularly imbedded in a homogeneous substance. A similar structure is seen to exist in the filaments of the Cydippe, and the bodies of the Hydroid zoophytes and of the simpler Nematoid worms are composed of a like substance. When one of the cilia of a Cydippe is cut off, it has, of itself, no power of motion, but if the